(2)

IDA DOCUMENT D-573

TESTING R&D AND PLANNED APPLICATIONS TO ENLISTED PERSONNEL SELECTION AND CLASSIFICATION:

PROCEEDINGS OF A TOPICAL AREA REVIEW DECEMBER 8-9, 1988

Editors:

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January 1989

Prepared for
Office of the Under Secretary of Defense for Acquisition

IDA

INSTITUTE FOR DEFENSE ANALYSES
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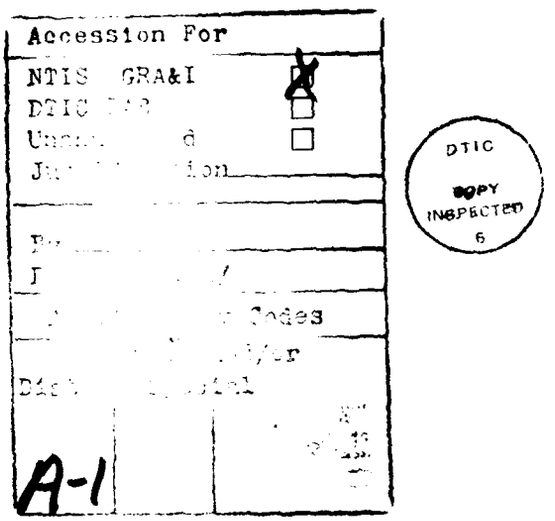
January 1989

INSTITUTE FOR DEFENSE ANALYSES

Contract MDA 903 84 C 0031
Task T-D2-435

ABSTRACT

A topical area review was held on December 8-9, 1988 to discuss research and development on testing enlisted personnel and how to apply the research findings to the selection and classification procedures used by the military services. The proceedings of the meeting consist of presentations made by members of the service laboratories, headquarters organizations and defense agencies.



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INTRODUCTION

EARL A. ALLUISI
OFFICE OF THE DIRECTOR OF
DEFENSE RESEARCH AND ENGINEERING
(RESEARCH AND ADVANCED TECHNOLOGY)

W. STEVEN SELLMAN
OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
(FORCE MANAGEMENT AND PERSONNEL)

INTRODUCTION

A topical area review of research and development on testing and on plans for application of the findings to the selection and classification of enlisted personnel was held on December 8-9, 1988, at the Institute for Defense Analyses (IDA), Alexandria, Virginia. The purpose of the review was to bring together the research and development and the user communities concerned with testing to ensure that each is aware of the other's activities and that the research and development programs meet the needs of the existing and planned selection and classification programs.

The review was held at the request of George P. Millburn, Deputy Director, Defense Research and Engineering (Research and Advanced Technology) and Grant S. Green, Jr., Assistant Secretary of Defense (Force Management and Personnel). They were represented at the review by Dr. Earl A. Alluisi, Assistant for Training and Personnel Systems Technology (ODDR&E/R&AT) and Dr. Wayne S. Sellman, Director for Accession Policy (OASD/FM&P), who are responsible, respectively, for research and development on testing and for the application of research on testing to selection and classification.

Interest and concern have been expressed by the Congress, the Office of the Secretary of Defense, and the Services regarding the R&D test-development process to ensure equitable screening, selection, and classification of enlisted personnel. A major purpose of the review, therefore, was to discuss plans for the implementation of the products being developed by the R&D program. Additionally, the review provided an opportunity to identify any gaps in R&D that may need to be filled, as well as any new developments or initiatives for which transition plans need to be drawn.

Presentations were made by members of the Service personnel research laboratories, Service headquarters and Defense agencies. Attendees included additional members of these organizations as well as representatives of the using agencies that test, select and classify members of the military services. Material presented at the meeting is contained in this report.

In addition, a White Paper on Enlisted Testing will be prepared and published later to provide a summary technical review of the military value of testing and the potential for increased value with further development and implementation of the area.

Earl A. Alluisi
Office of the Deputy Director of
Defense Research and Engineering
(Research and Advanced Technology)

Wayne S. Sellman
Director of Accession Policy
Office of Assistant Secretary of Defense
(Force Management and Personnel)

THE ARMY PROGRAM

N. KENT EATON
ARMY RESEARCH INSTITUTE

TOPICAL AREA REVIEW -- TESTING R&D

Presented to:

SERVICE TESTING POLICY AND R&D REPRESENTATIVES

8 December 1988

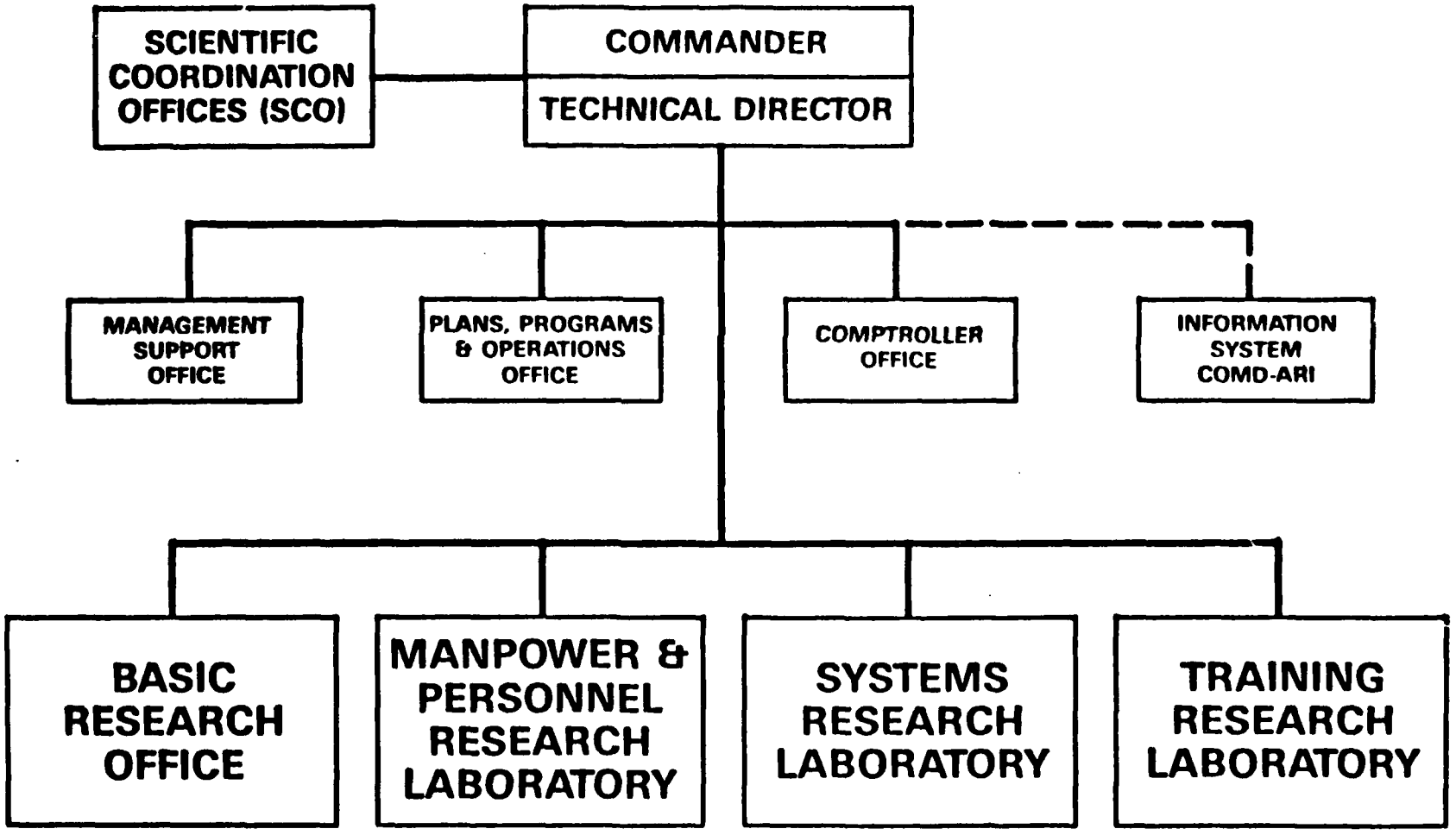
Presented by:

U.S. Army Research Institute

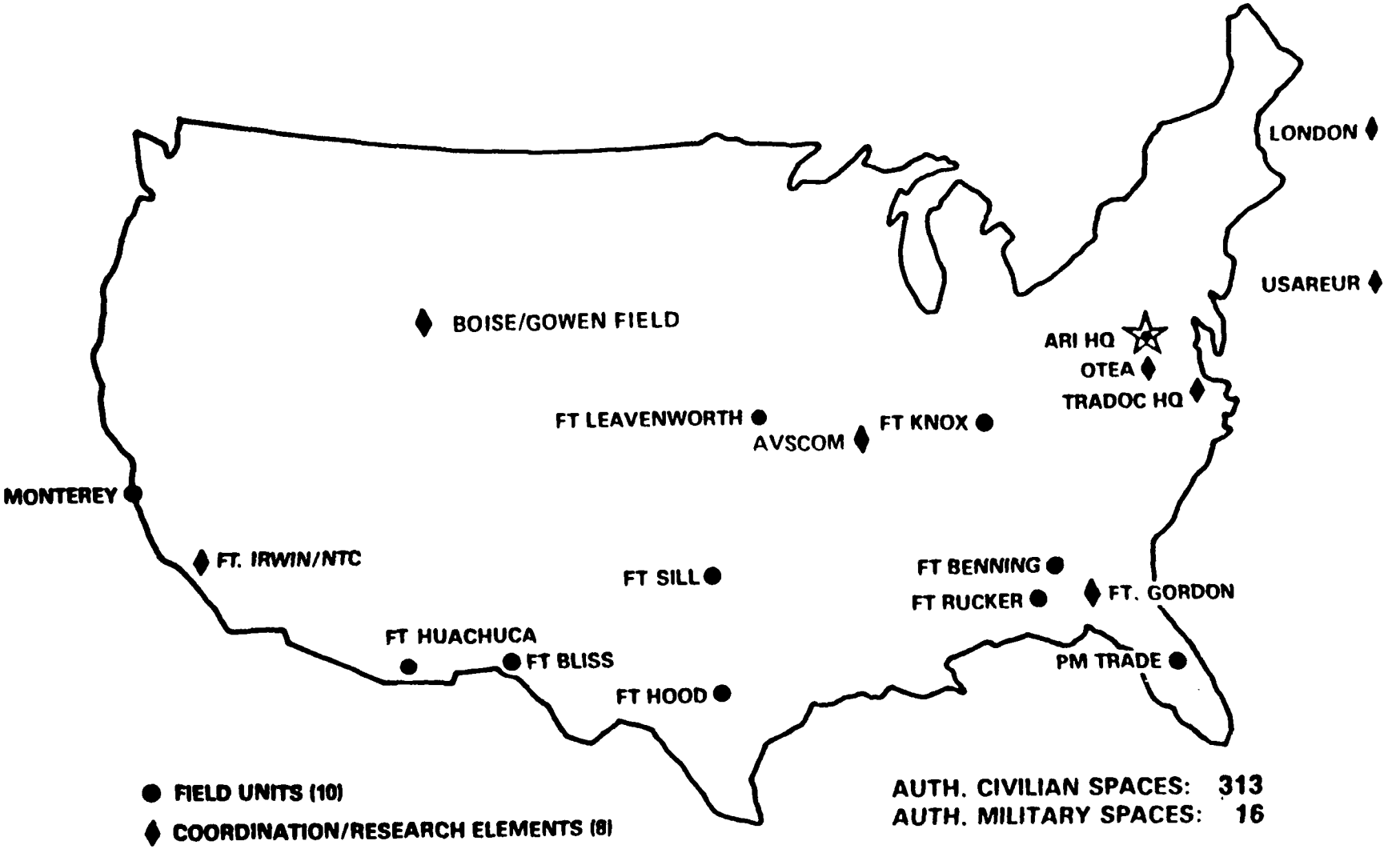
Selection & Classification Technical Area

AV 284-8275 or Comm (202) 274-8275

ARI ORGANIZATIONAL STRUCTURE



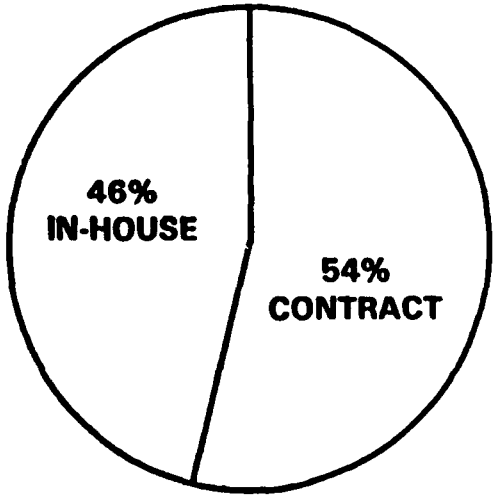
FIELD UNITS AND COORDINATION/ RESEARCH ELEMENTS



SEP 88

THE ARI WORK PROGRAM

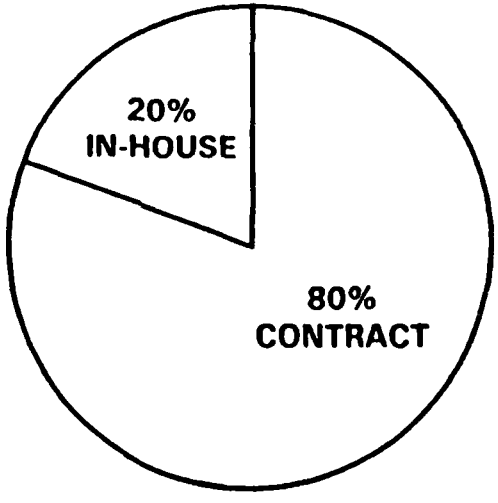
1980



164 WORK UNITS

$25.3M BUDGET
200 SCIENTISTS

1988



337 WORK UNITS

$59.7M BUDGET
205 SCIENTISTS

MAJOR NEW PROGRAMS

MANPOWER AND PERSONNEL RESEARCH LABORATORY (EST. 1981)

- SELECTION AND ASSIGNMENT (PROJECTS A&B)
- RECRUITING
- MANPOWER & PERSONNEL POLICY
- FAMILY & RETENTION
- ARMY CIVILIAN RESEARCH

TRAINING RESEARCH LABORATORY

- COMBAT TRAINING CENTERS
- SIMULATOR EFFECTIVENESS
- RESERVE-SPECIFIC TRAINING
- BASIC SKILLS
- ENGINEERING DEVELOPMENT

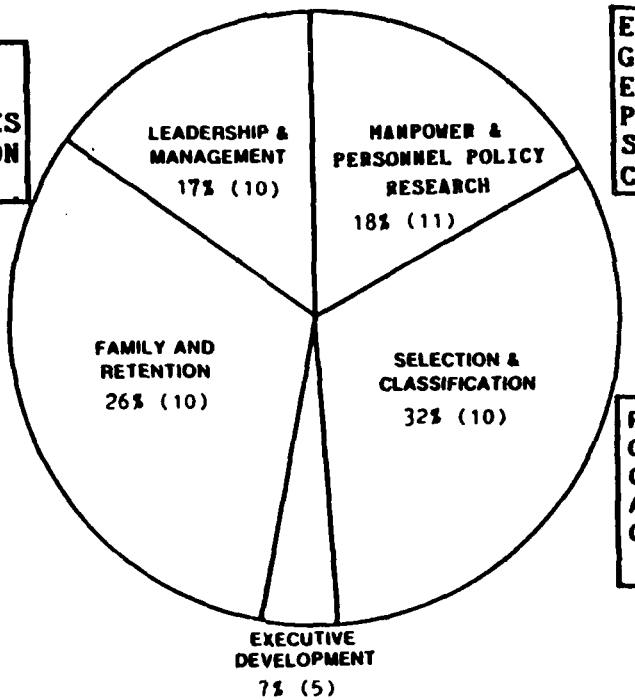
SYSTEMS RESEARCH LABORATORY

MANPRINT

MANPOWER AND PERSONNEL RESEARCH LAB

$13 M BUDGET FOR FY89
$8.28 M CONTRACTS
50 Scientists on Board (31 Oct)
FY89 Distribution of $

(Scientists on Board)



*LEADERSHIP, MOTIVATION, COHESION & UNIT PERFORMANCE
*NTC/JRTC ROTATIONS & NON-U.S. ARMIES
ARMY CIVILIAN PERFORMANCE, SELECTION AND SUPERVISOR TRAINING

LEADERSHIP & MANAGEMENT

ENLISTMENT FORECASTING/MISSIONING
GEODEMOGRAPHICS
ENLISTMENT POLICY RESEARCH
PROJECT B: PERSONNAL ALLOCATION
SOLDIER LIFECYCLE COSTING
COMPENSATION

MANPOWER & PERSONNEL POLICY RESEARCH

"FAMILY PROJECT"
-- SOLDIER RETENTION
-- SOLIDER/FAMILY READINESS
-- SPOUSE EMPLOYMENT
-- FAMILY ADAPTATION
OFFICER RETENTION
REENLISTMENT MODELING
DUAL CAREER
RESERVE ATTRITION

FAMILY AND RETENTION

PROJECT A: RETENTION & 2ND TOUR
COMPUTER ADAPTIVE TESTING (CAT)
QUALITY REQUIREMENTS
ARMY ENTRANCE STANDARDS
COMBAT ARMS PSYCHOMOTOR/ SPATIAL/FAST TRACK

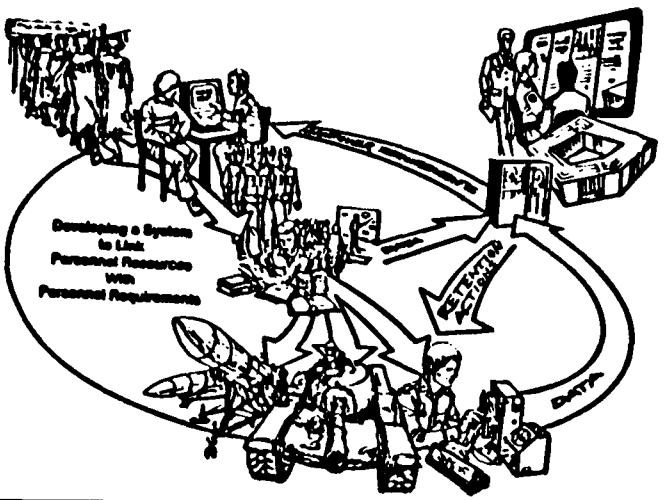
SELECTION AND CLASSIFICATION

LEADER DEVELOPMENT
LEADERSHIP FOR THE 90'S
DESCOM MODERNIZATION

EXECUTIVE DEVELOPMENT

*Part of ARI integrated CTC research program under TRL

ARI Selection and Classification Technical Area



Tasks

231 Linking soldier selection to job performance

232 Developing and validating Army tests for selection and classification

237 Implementing special screening tests for critical MOS

Funds spent and projected by FY

	FY89	FY90	FY91	FY92	FY93
$	3,866	4,179	3,182	2,980	2,980
PSY	14(10)				

In-house

Objectives

- To maintain and improve Army enlisted job performance through research on selection and classification.

  Specifically, by:

  a. Validating ASVAB and new tests against first tour and longer range job performance

  b. Developing methods for applying validity data to new MOS

  c. Developing methods for setting minimum qualifying standards for new MOS

  d. Implementing newly developed tests

  e. Determining the value of alternative selection systems

Selection and Classification Research
Topical Area Review

- Developing and Validating Army S&C Tests
  Darlene Olson
- Linking Soldier Selection to Job Performance
  Jane Arabian
- Computerized Adaptive Screening Test
  Michael Rumsey
- Implementing Special Screening Tests
  Clinton Walker

DEVELOPING AND VALIDATING ARMY SELECTION AND CLASSIFICATION TESTS

DARLENE OLSON
ARMY RESEARCH INSTITUTE

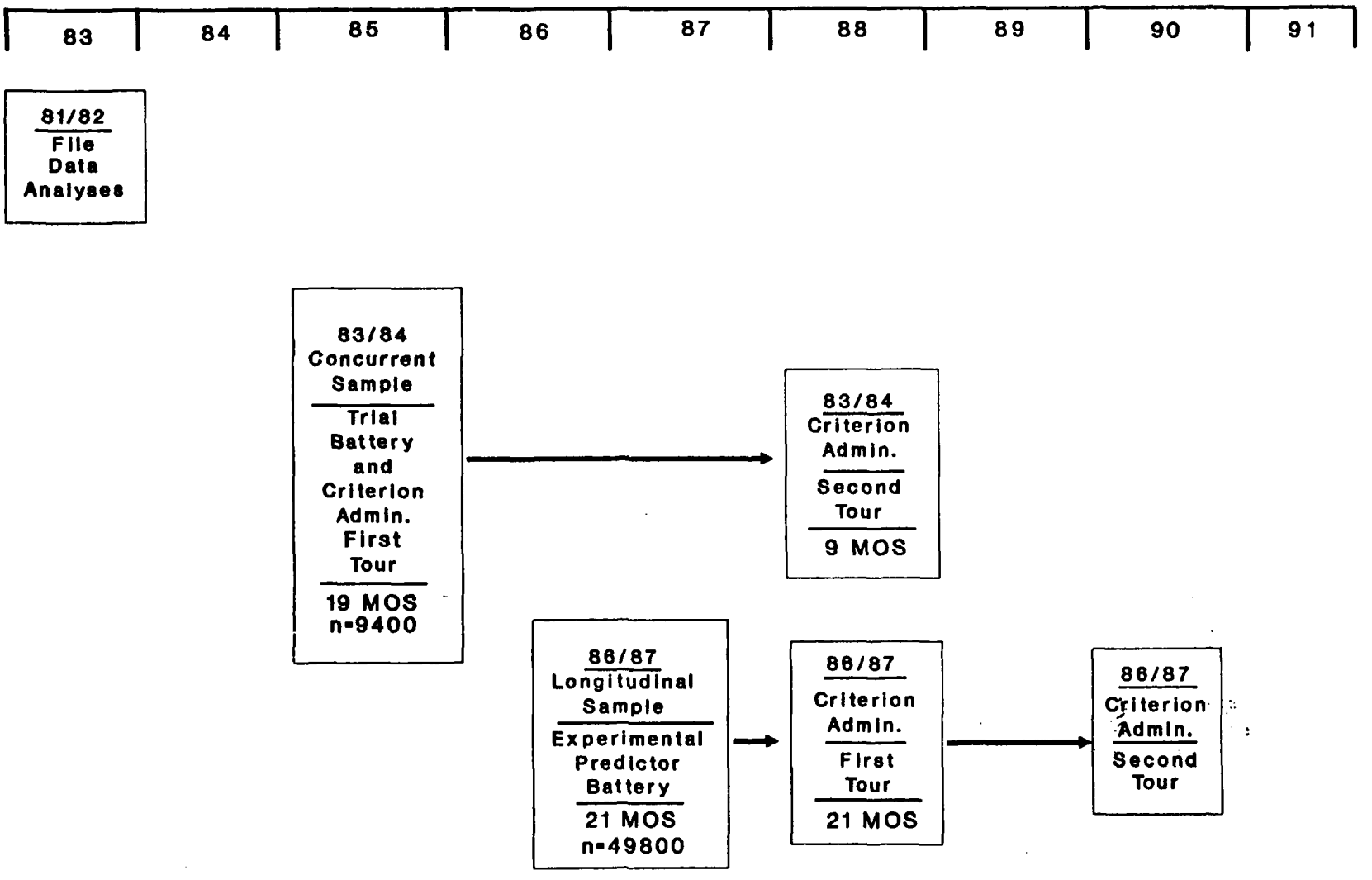
2.3.2 Developing and Validating Army Selection and Classification Tests

RESEARCH TASK

Developing and Validating Army Selection and Classification Tests

- Project A
- Building and Retaining the Career Force
- Determine Value of Alternative Selection and Classification Systems
- Inter-Service Working Groups

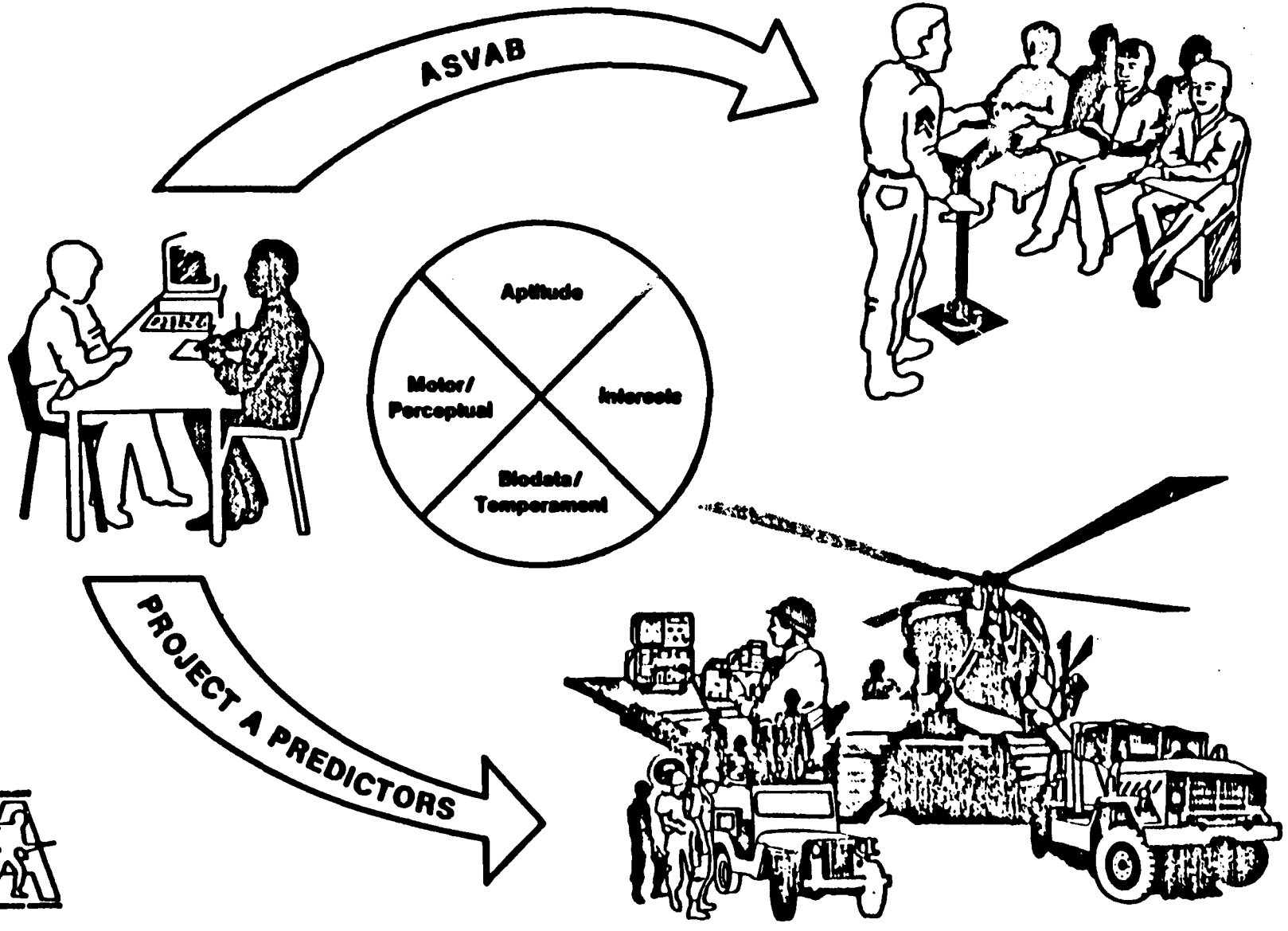
PROJECT A RESEARCH FLOW



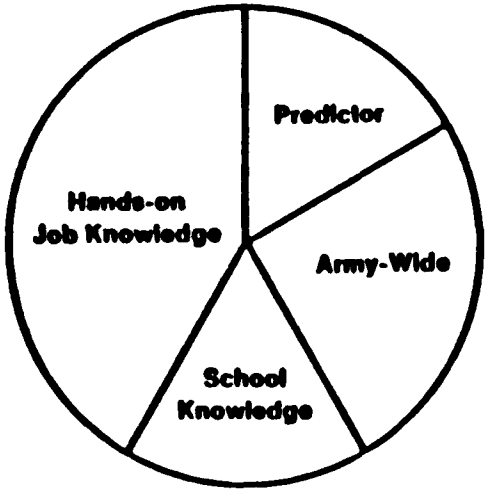
OBJECTIVES

- Validate Current and Future ASVAB Against On-the-Job Performance:
  - 1st Tour
  - 2nd Tour
- Expand Selection and Classification Tests to Consider:
  - Perceptual Ability
  - Psychomotor Ability
  - Temperament
  - Vocational Interest
- Develop Algorithms and Computer-Based Procedures to Improve (Optimize) Soldier-MOS Assignment

PROJECT A PREDICTORS

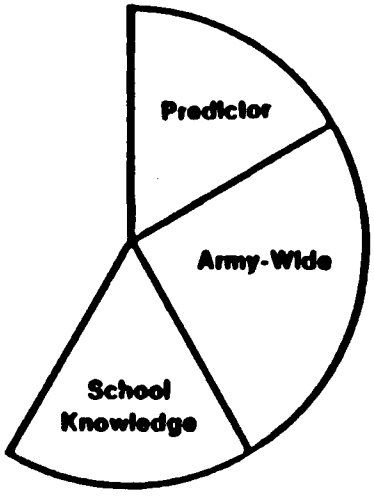


PROJECT A PERFORMANCE MEASURES



FULL TREATMENT
(Batch A)

MOS	TITLE	MOS	TITLE
13B	Cannon Crewman	11B	Infantryman
64C	Motor Transport Oper	19E	Tank Crewman
71L	Admin Specialist	31C	Radio TT Oper
95B	Military Police	63B	Vehicle & Generator Mech
		91A	Medical Care Specialist

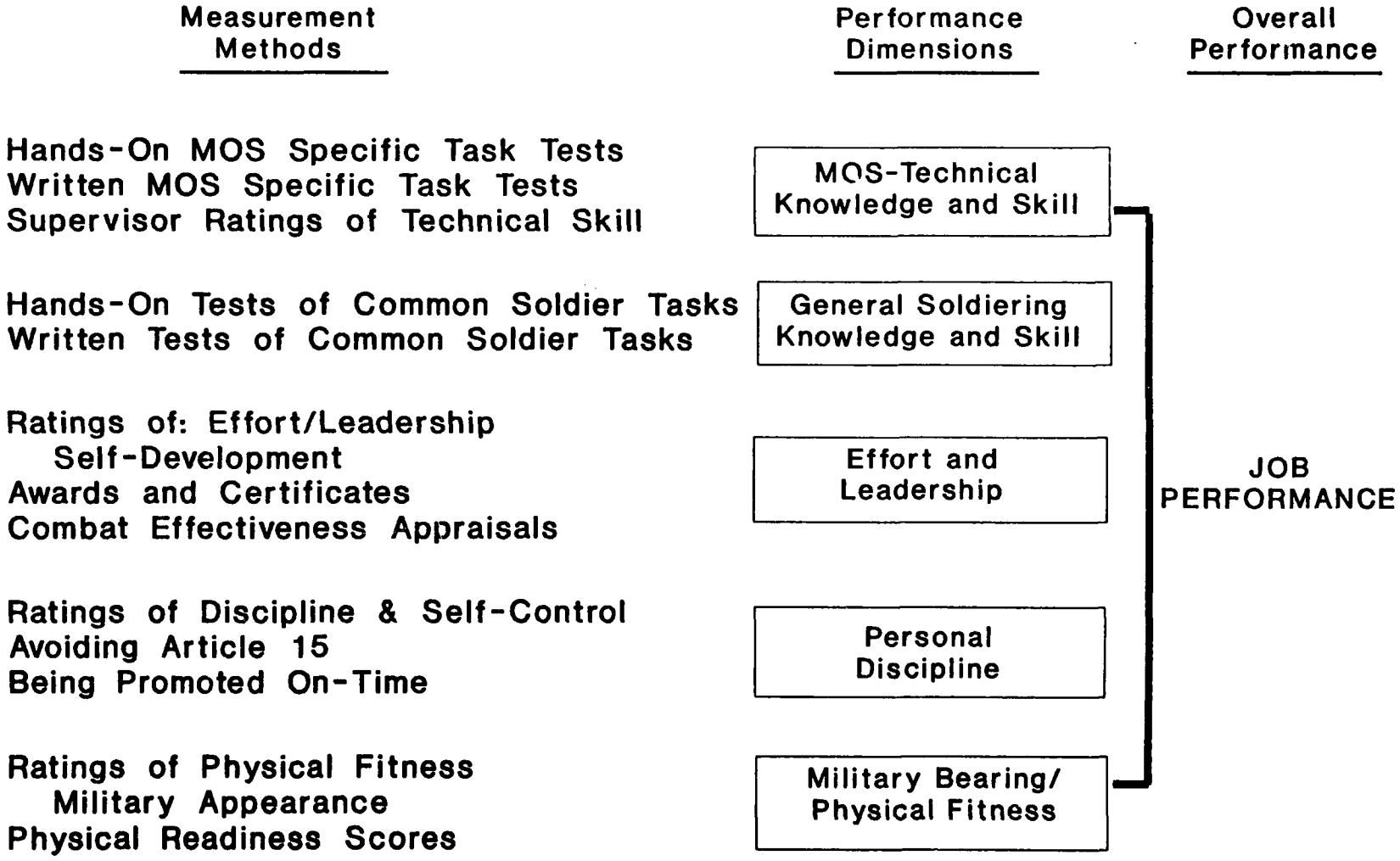


PARTIAL TREATMENT
(Batch Z)

MOS	TITLE	MOS	TITLE
12B	Combat Engineer	55B	Ammunition Spec
16S	MANPADS Crewman	67N	Utility Helicopter Rpr
27E	Tow/Dragon Rpr	76W	Petroleum Supply Spec
*29E	C-E Radio Repairer	76Y	Unit Supply Spec
51B	Carpentry/Masonry Spec	94B	Food Service Spec
54E	Chemical Operations Spec	*96B	Intelligence Analyst

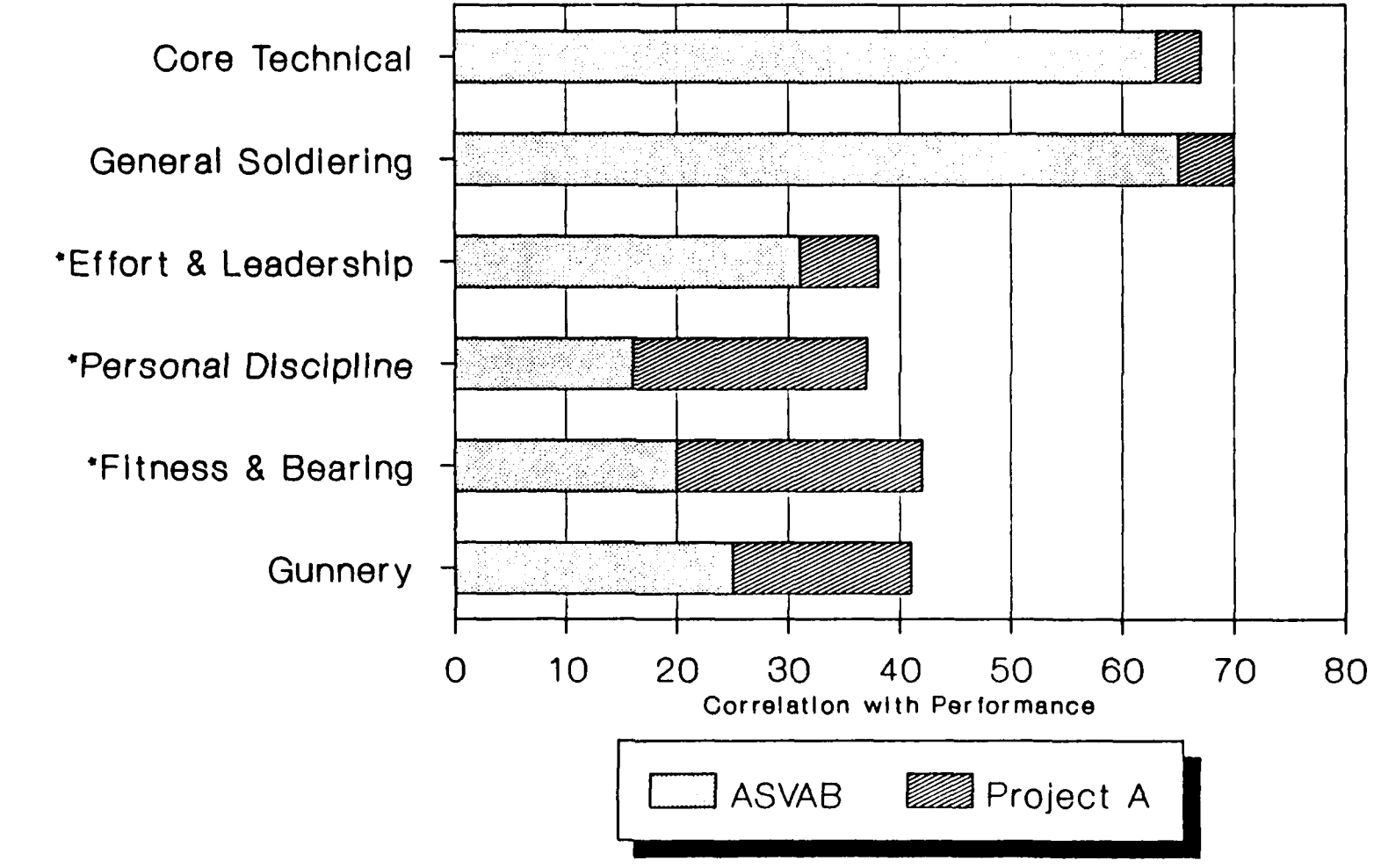
*New MOS Included for Longitudinal Validation

Project A Performance Constructs



Project A

Gains in Predicting First Tour Performance



*ABLE Predicts

NEW SELECTION TESTING FOR EXCELLENCE IN GUNNERY: THE OPPORTUNITY

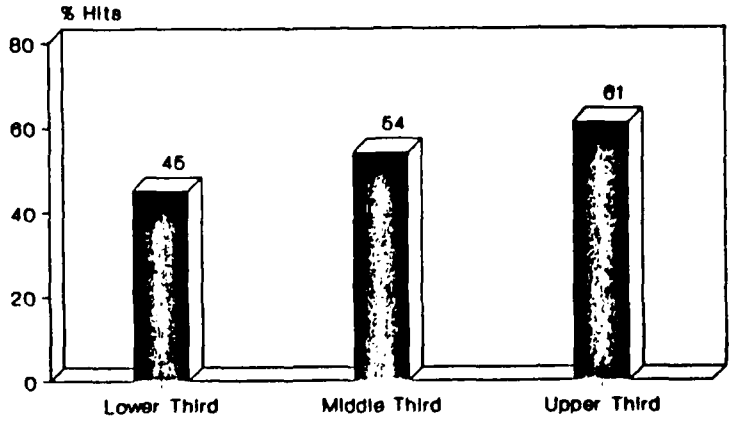
Situation:

- **Tests developed under Project A are found to measure "gunners' abilities' -- spatial and psychomotor aptitudes.**

Data:

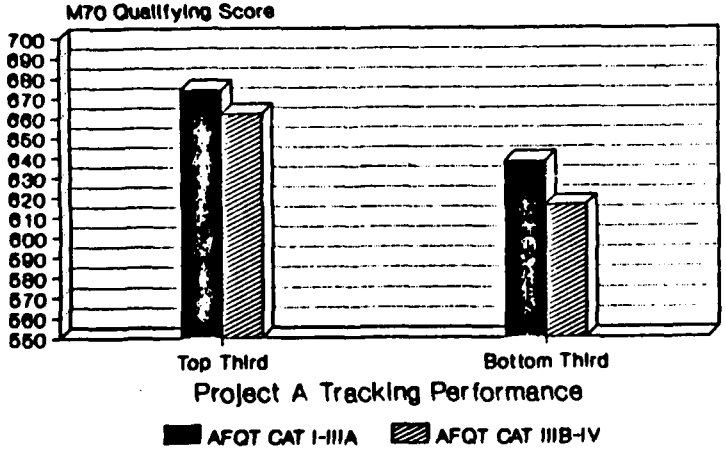
- **High scores on these Project A tests perform significantly better on the M-70 and UCOFT devices than do low scorers in ARI research with 11Hs and Armor Officers.**

UCOFT Gunnery Performance



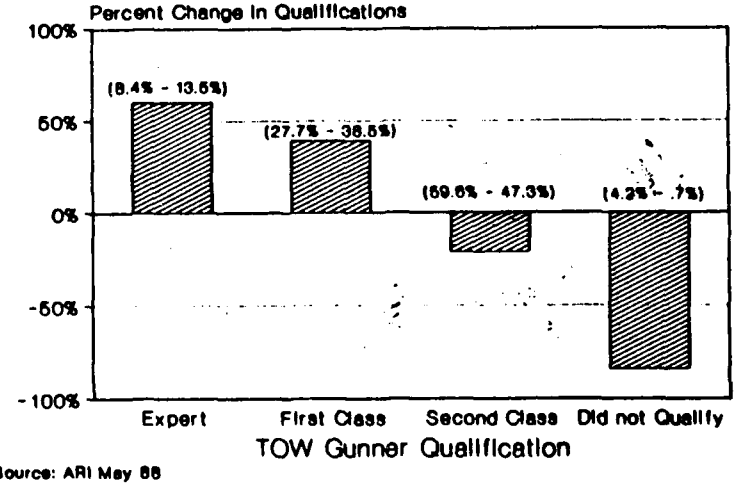
Project A
Test Battery Score Range

Mean M70 scores by AFQT for High and Low Performance on Project A Tracking



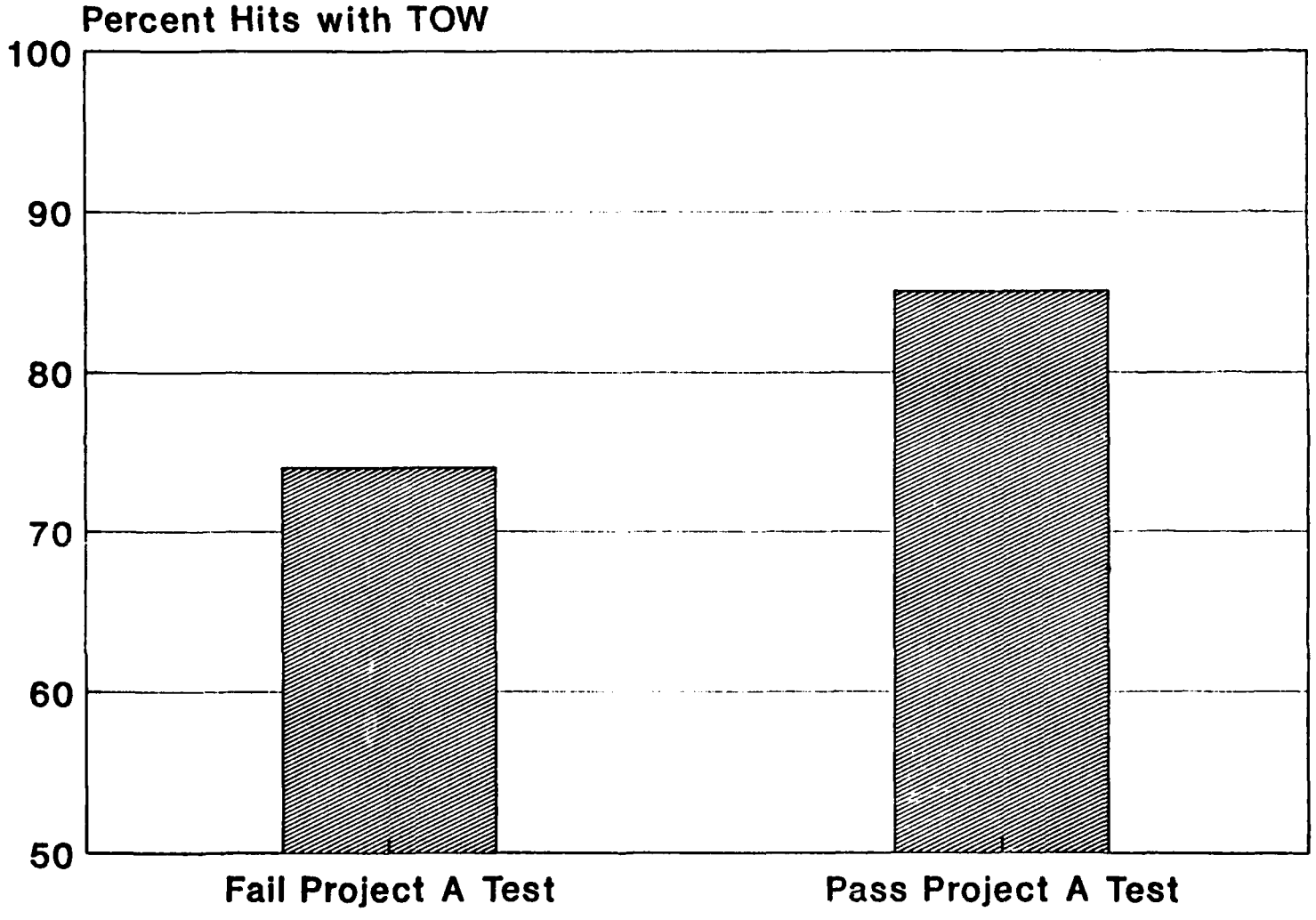
Source: ARI, December 1987

Improving TOW Gunnery
Using Psychomotor/Spatial Tests and ABLE



Source: ARI May 88

Project A Test Improves Live Fire Hits*

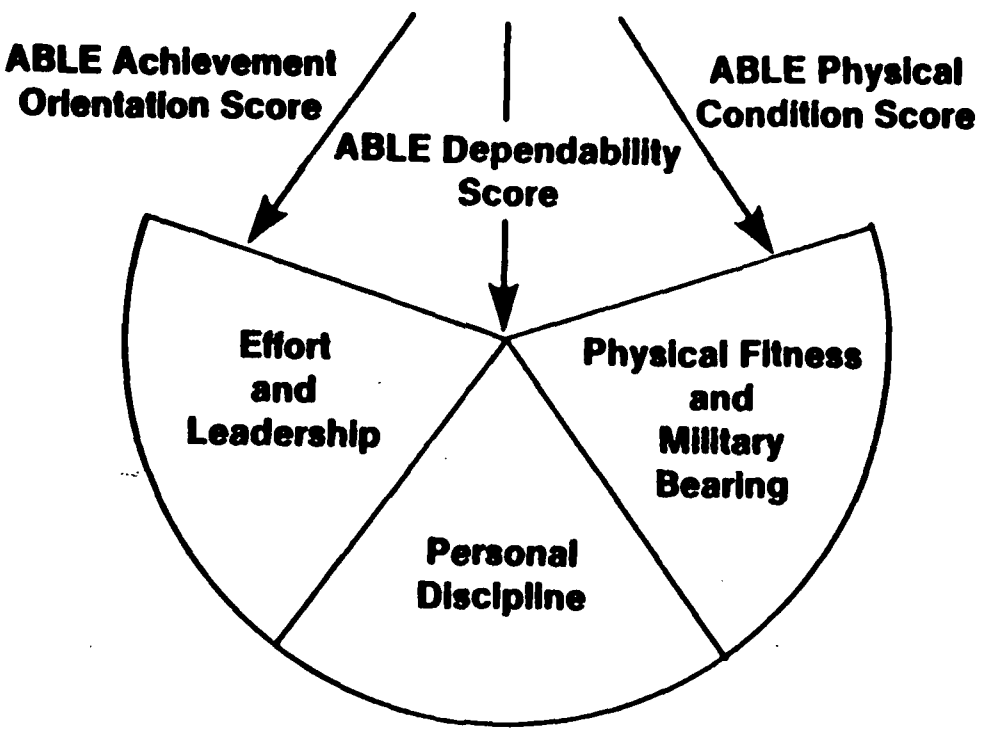


Source: ARI November 1988 *Target 2000 Yards

ASSESSMENT OF BACKGROUND
LIFE EXPERIENCES (ABLE)

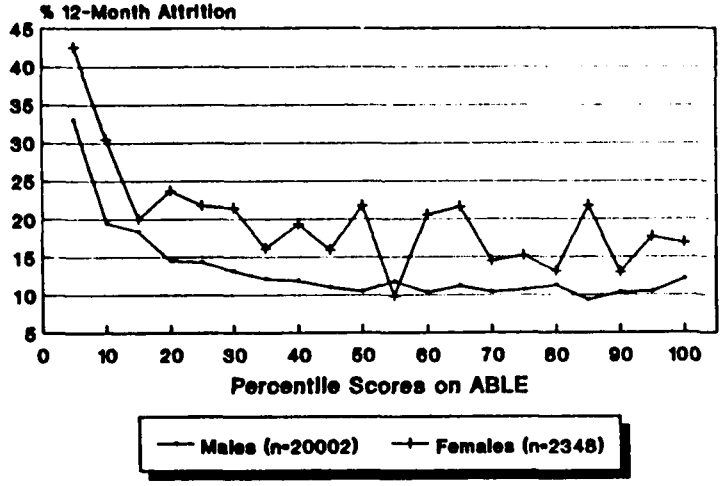
- ABLE is a non-cognitive test from Project A
  - Measures temperament and personal history
  - Average of 35 minutes to administer
  - 199 items (Research Form)
- To reduce attrition and disciplinary problems
- To predict leadership potential

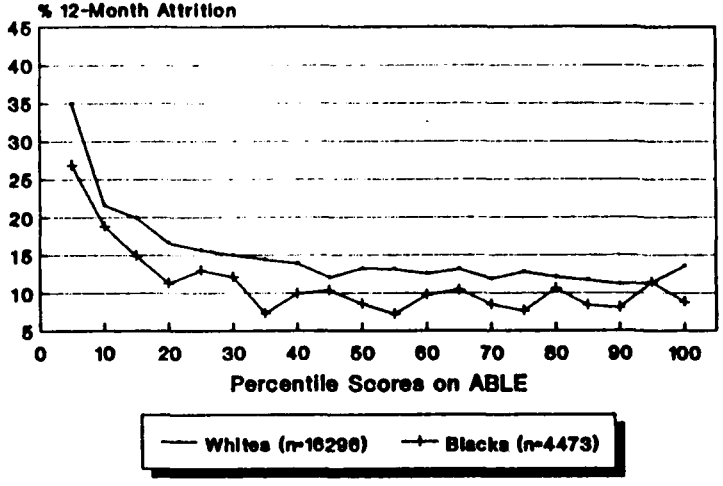
PREDICTION OF JOB PERFORMANCE USING THE ABLE



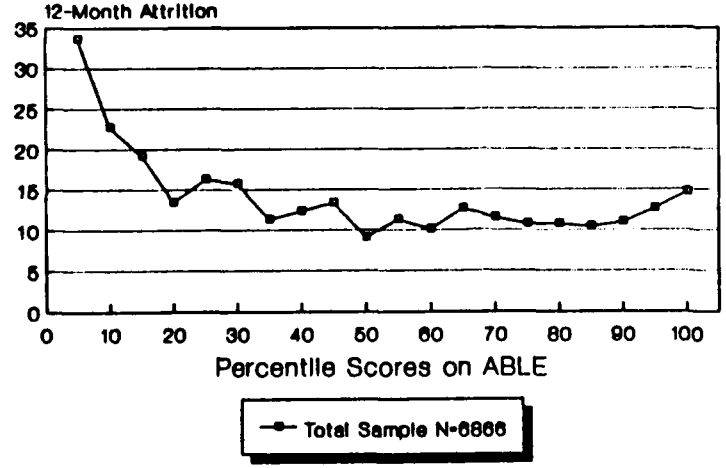
* ABLE Adjustment Score → Attrition

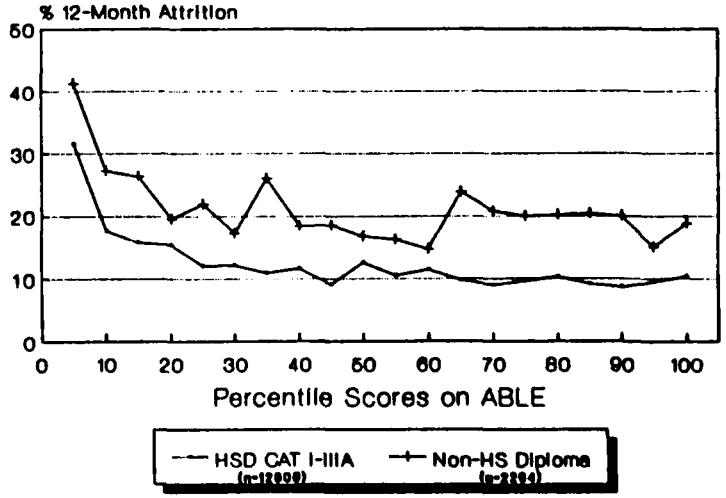
ABLE Predicts Attrition



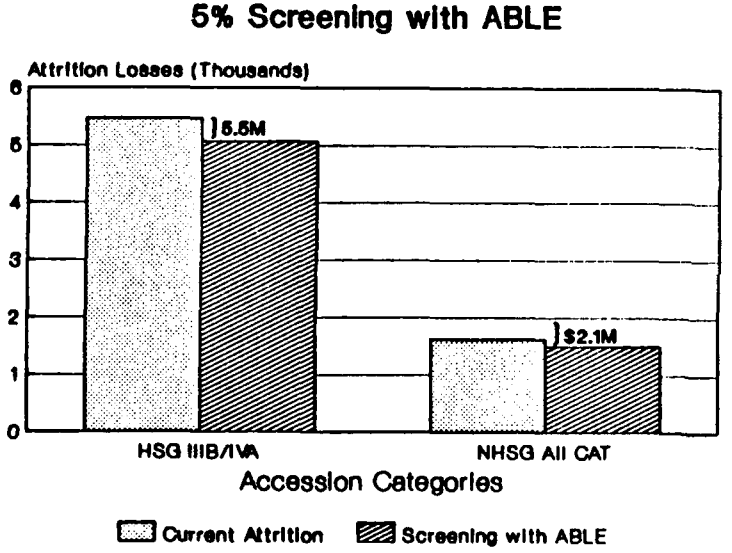


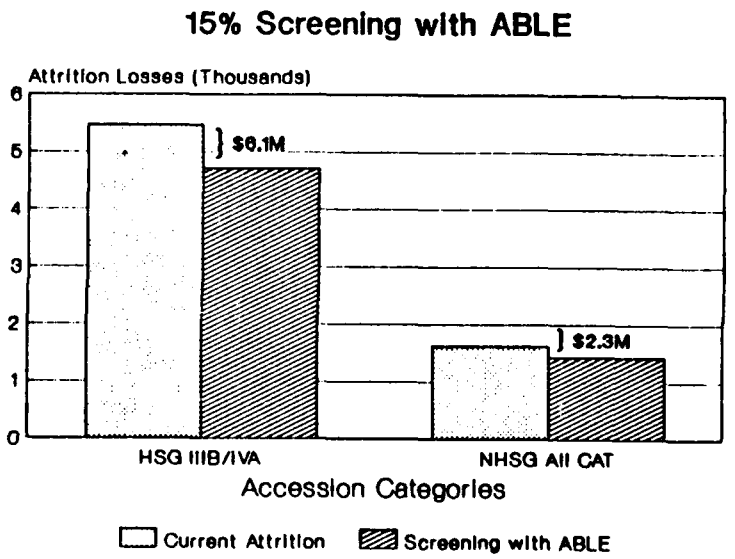
CAT IIIB/IVA High School Graduates





Annual Dollar Savings from ABLE Due to Reduced 12-Month Attrition





ABLE PREDICTS PERSONAL DISCIPLINE

Situation:

- ABLE Test (Assessment of Background and Life Experiences) developed under Project A is found to measure *leadership* and *motivational* characteristics ("will-do" performance).

Data:

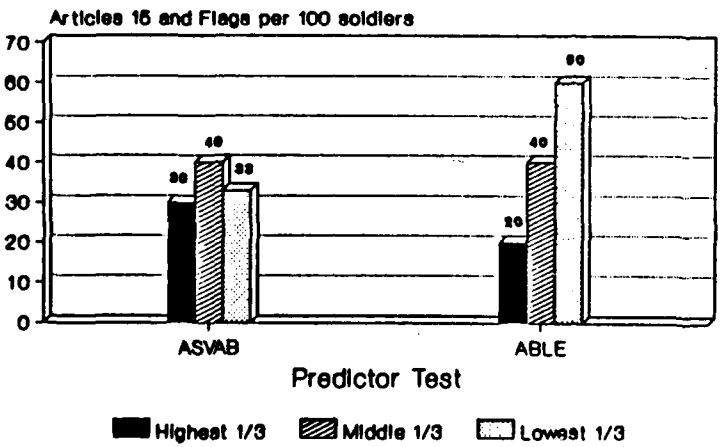
- High scorers on the ABLE Dependability composite fewer disciplinary problems and are rated higher in personal discipline.

DISCIPLINE

Definition

- Adheres to Regulations
- Exercises Self Control
- Demonstrates Integrity
- Does Not Cause Disciplinary Problems

ABLE Predicts Discipline Better than ASVAB



Prediction of Job Performance Using the ABLE

Personal Discipline

ABLE Dependability Score	Personal Discipline Performance Level		
	Superior	Average	Below Average
Top 1/3	46%	32%	22%
Middle 1/3	35%	34%	31%
Lowest 1/3	20%	33%	47%

ABLE PREDICTS EFFORT AND LEADERSHIP

Situation:

- ABLE Test (Assessment of Background and Life Experiences) developed under Project A is found to measure *leadership* and *motivational* characteristics ("will-do" performance).

Data:

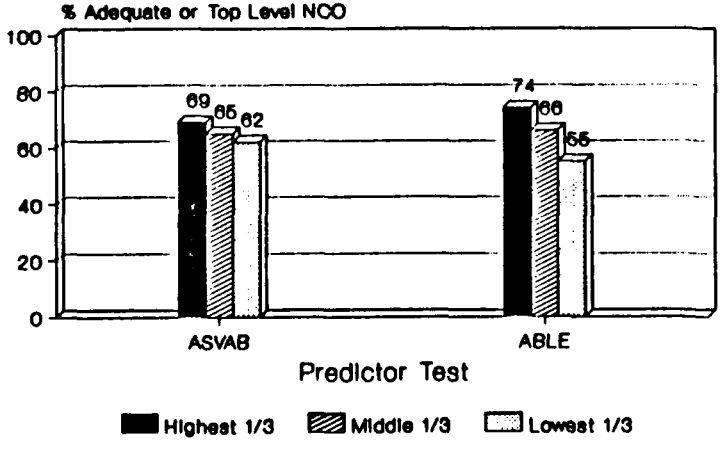
- High Scores on the ABLE achievement orientation scale exert greater job effort and are rated as having higher leadership potential.

EFFORT AND LEADERSHIP

Definition

- Effort over all job tasks
- Perseveres under adverse conditions
- Leadership, supportiveness toward peers

ABLE Predicts NCO Potential Better than ASVAB



Prediction of Job Performance Using the ABLE Effort and Leadership

ABLE Achievement Orientation Score	Effort and Leadership Performance Level		
	Superior	Average	Below Average
Top 1/3	47%	32%	21%
Middle 1/3	32%	35%	33%
Lowest 1/3	21%	34%	45%

New Contract: Building and Retaining the Career Force

Develop selection, classification, and decision-making procedures to maximize quality of career force

- Prediction of Second Tour Performance from:
  - Pre-enlistment selection and classification tests
  - Training measures
  - First tour job performance
- Prediction of Attrition and Re-enlistment
- Conduct Research Analyses Needed for Implementation

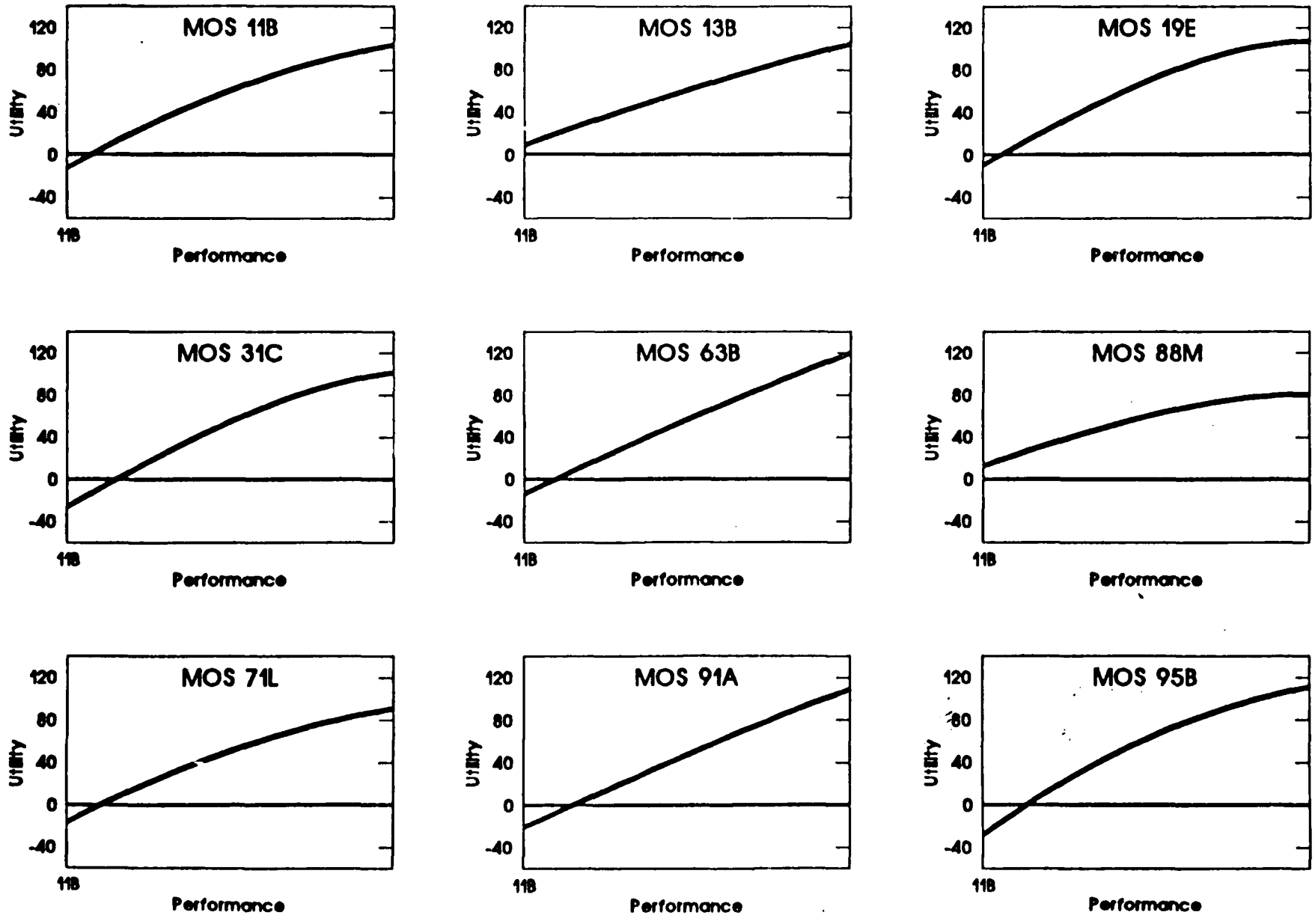
DETERMINING THE VALUE OF ALTERNATIVE SELECTION AND CLASSIFICATION SYSTEMS

- Development of Job Satisfaction Questionnaire
- Work Environment Questionnaire
- Relative Utilities of Alternative Distributions of Performance

JOB SATISFACTION QUESTIONNAIRE

- PREDICTOR OF
  - ATTRITION
  - REENLISTMENT
  - "WILL DO" PERFORMANCE
- CRITERION FOR ABLE, AVOICE
- 30-40 ITEM MEASURE OF SATISFACTION WITH
  - SUPERVISION
  - CO-WORKERS
  - PROMOTIONS
  - PAY
  - WORK
  - ARMY
  - OVERALL SATISFACTION

Figure 1
Performance Utility Functions for Nine Army MOS



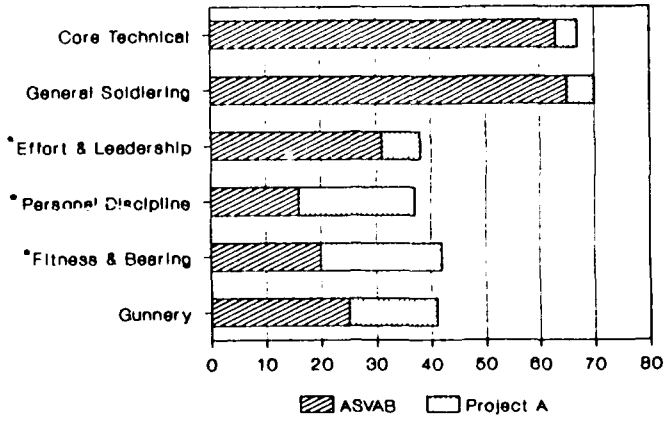
PROJECT A CONTRIBUTION TO ARMY READINESS

Better Soldiers During Years of Declining Manpower Pool

- Expand Recruiting Base
- Race/Gender Fair
- ASVAB Quality Requirements
- Classification/Utilization
- Discipline
- Leadership
- Specialized Psychomotor Skills
- Retention

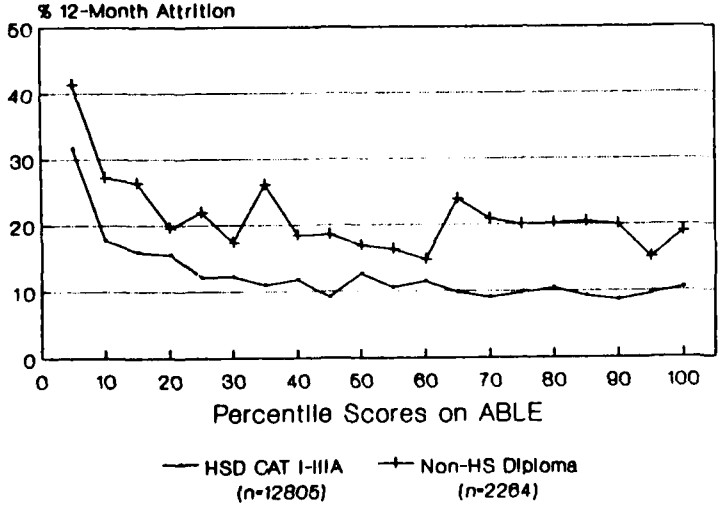
Better Basis for MANPRINT Decisions

Gains In Predicting First Tour Performance

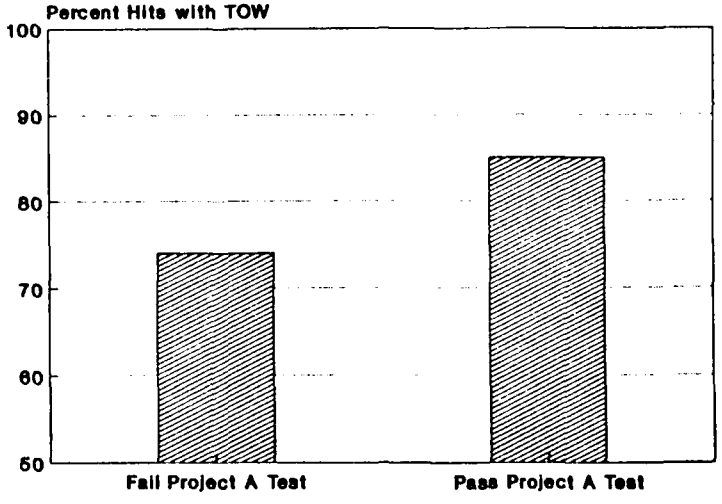


*ABLE Predicts

ABLE Predicts Attrition



Project A Test Improves Live Fire Hits*



Source: ARI November 1988 *Target 2000 Yards

LINKING SOLDIER SELECTION TO JOB PERFORMANCE

JANE ARABIAN
ARMY RESEARCH INSTITUTE

2.3.1 Linking Soldier Selection to Job Performance

The Army's Synthetic Validation Project

SYNTHETIC VALIDATION PROJECT GOALS

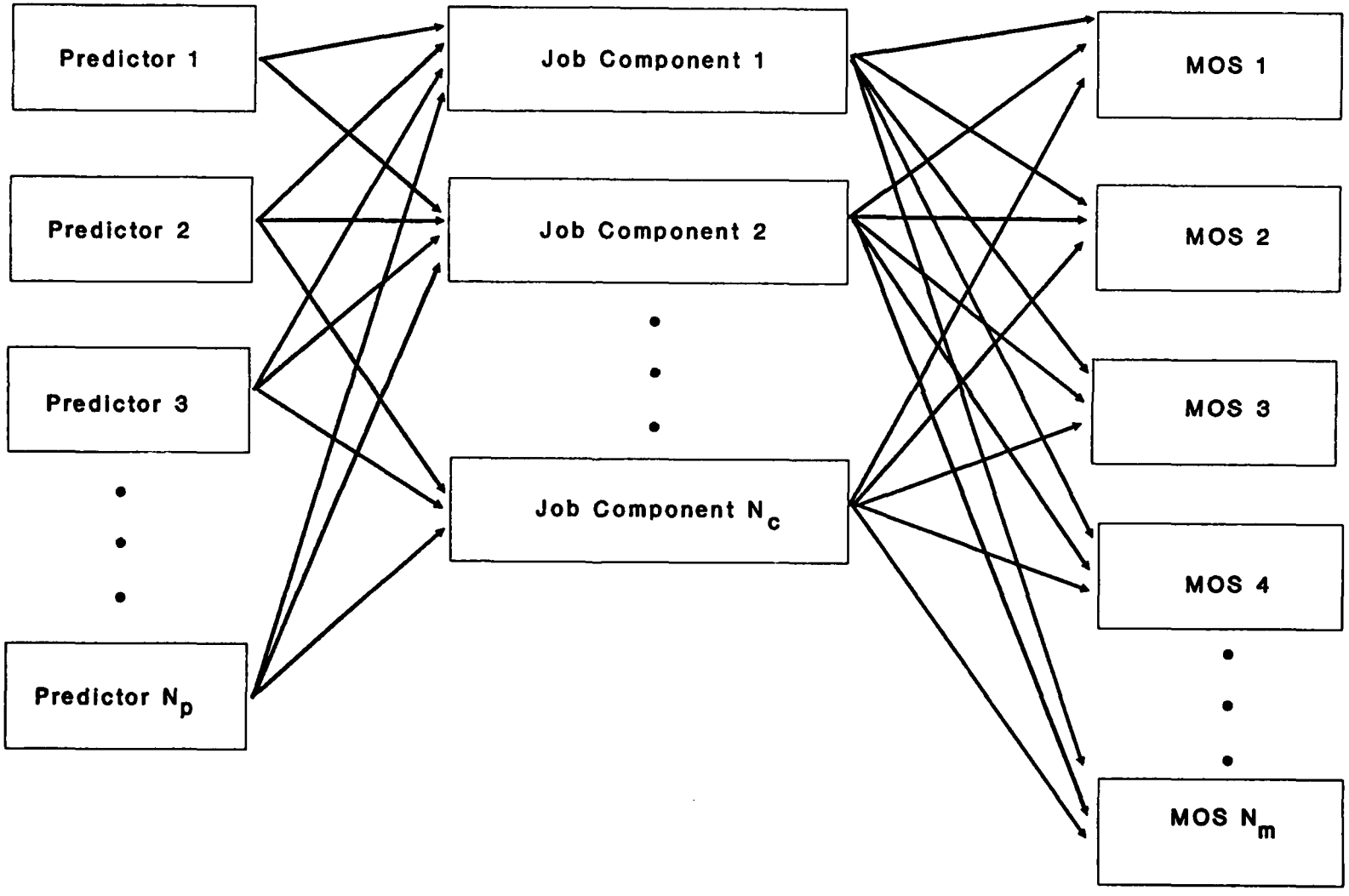
- **Develop Procedures for Identifying Job Performance Prediction Equations**
  - -- **For new MOS**
  - -- **For MOS with few incumbents**
  - -- **When it is impractical or infeasible to derive empirical prediction equations (e.g., MOS not included in Project A)**

- **Develop Procedures for Establishing Selection Test Cutting Scores That Are Linked to Job Performance**
  - -- **To identify minimally qualified recruits**
  - -- **To identify recruits with outstanding potential**

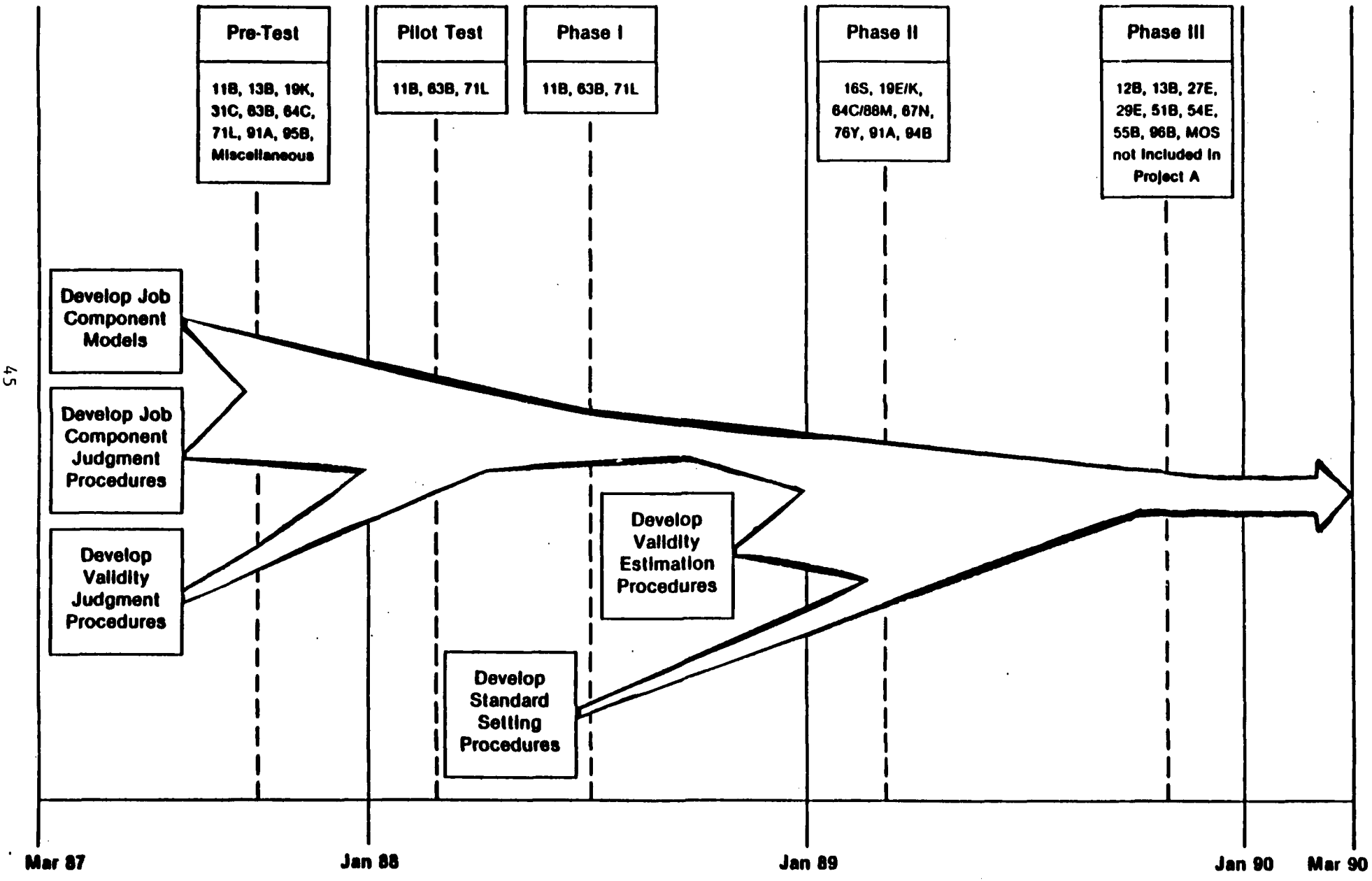
SYNTHETIC VALIDATION PROJECT
RESEARCH DESIGN

- General Approach
  - -- Identification of prediction equations
  - -- Establishment of cutting scores
- Iterative Data Collection
  - -- Three phases
  - -- Initial emphasis on Project A MOS
- Comparison of Multiple Approaches
  - -- Three job component models
  - -- Three approaches to setting performance standards

Identification of Prediction Equations Using Synthetic Validation Techniques



Synthetic Validation Project Flow



SYNTHETIC VALIDATION RESEARCH: PROGRESS TO DATE

- Development of Three Job Component Models
  - -- Task categories
  - -- Job behaviors
  - -- Attributes
- Refinement of Judgment Protocol
  - -- Definitions and instructions
  - -- Types of judgments obtained
- Reliability of Judgments
- Comparison of Different Kinds of Judges

SINGLE-RATER RELIABILITY OF JOB COMPONENT JUDGMENTS FOR ARMY JUDGES

Job Component Model	MOS		
	Infantryman (11B)	Vehicle Mechanic (63B)	Administrative Specialist (71L)
Task Categories*	.52	.36	.40
Job Behaviors*	.36	.23	.43
Attributes**	.31	.34	.45

* Based on Core Technical importance rating

** Based on Core Technical validity rating

CORRELATION OF MEAN JOB DESCRIPTION PROFILES ACROSS MOS

Performance Area	Type of Model	MOS		
		11B and 63B	11B and 71L	63B and 71L
Core Technical Proficiency	Tasks	.52	.19	.39
	Behaviors	.26	.11	-.06
	Attributes	.52	.49	.35
General Soldiering Proficiency	Tasks	.87	.84	.87
	Behaviors	.86	.77	.66
	Attributes	.87	.87	.78
Effort and Leadership	Attributes	.93	.92	.86
Personal Discipline	Attributes	.92	.89	.90
Physical Fitness and Military Bearing	Attributes	.94	.91	.91

Mean Validities: Absolute Validities and Discriminant Validities (Differences from Off-Diagonal Validities)

Attribute Weights	Task Model Component Wts Total	Task Model Component Wts Adj	Activity Model Component Wts Total	Activity Model Component Wts Adj	Attribute Model Psych	Attribute Model Soldier
Validity Wts	.553 (.008)	.570 (.027)	.530 (.013)	.533 (.031)	.577 (.035)	.520 (.023)
Regr Wts	.380 (.032)	.383 (.078)	.370 (.038)	.363 (.081)	.397 (.164)	.343 (.073)
Unit Wts	620 (.025)	.627 (.045)	.590 (.033)	.560 (.138)	.520 (.003)	.530 (.027)

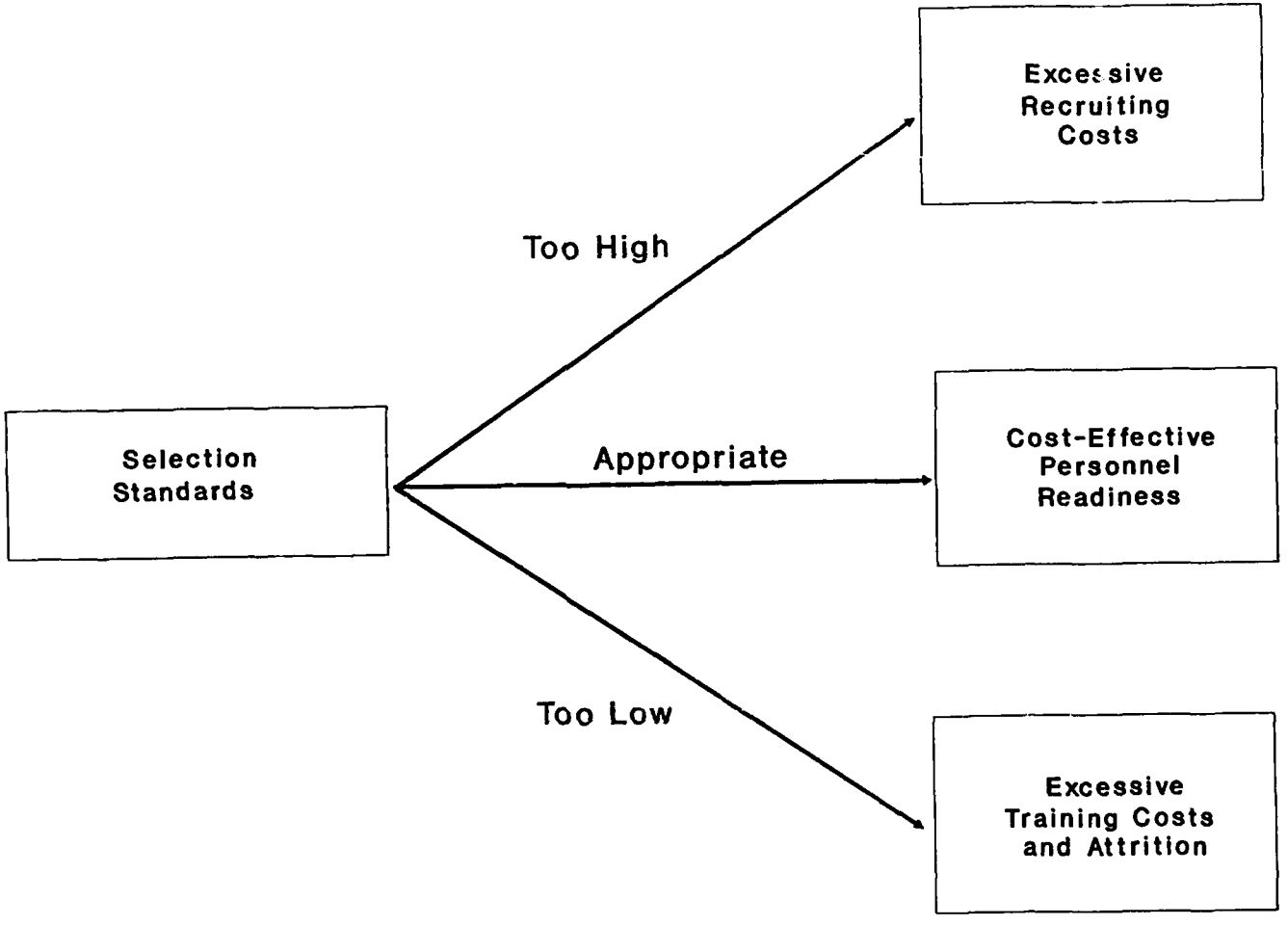
Note: The mean validity for the empirically derived equation (adjusted for shrinkage) is .673. This is .173 greater than the mean off-diagonal validity for these equations.

COST COMPARISON OF EMPIRICAL AND SYNTHETIC VALIDATION

- **Empirical Validation**
  - -- Development of job performance measures: $250,000
  - -- Data collection: $100,000
  - -- Data analysis: $150,000
  - -- Total: $500,000

- **Synthetic Validation**
  - -- Data Collection: $ 10,000
  - -- Data analysis: $ 5,000
  - -- Total: $ 15,000

Selection Standards and Cost-Effective Personnel Readiness



STANDARD SETTING RESEARCH: PROGRESS TO DATE

- Literature Review
- Identification of Performance Levels
- Development of Three Initial Approaches
  - -- Soldier-Based
  - -- Task-Based
  - -- Critical Incident-Based
- Development of Initial Judgment Protocol
- Tryout on Three MOS

PERFORMANCE LEVELS

- **Unacceptable:**

  Soldiers who consistently perform like this do not belong in the Army. Their performance is hurting the Army, and they should be discharged early.

- **Marginal:**

  Soldiers who consistently perform like this need remedial training. Their performance is of little or no benefit to the Army. Unless they receive training and improve their performance, they should be barred from re-enlistment.

- **Acceptable:**

  Soldiers who consistently perform like this are doing an adequate job. They are making positive contributions to the Army. They should be allowed to re-enlist.

- **Outstanding:**

  Soldiers who consistently perform like this are doing extremely well. They are making exceptional contributions to the Army and are excellent examples to their peers. They should be encouraged to re-enlist and should be given special consideration for promotion or extra responsibilities.

INITIAL STANDARD SETTING APPROACHES

- **Soldier-Based:**

  Direct estimation of the proportion of current job incumbents at each level of performance

- **Task-Based:**

  Assessment of acceptability of different levels of performance on the hands-on and job knowledge tests

- **Critical Incident-Based:**

  Assessment of acceptability of effective and ineffective behaviors described in critical incident workshops

Soldier Performance Distribution by MOS, Performance Factor, and Judgment Method

MOS	Performance Dimension	Method	N	% Unacceptable Mean	% Unacceptable S.D.	% Outstanding Mean	% Outstanding S.D.
11B	General Soldiering	Direct	80	8.0	5.3	12.4	9.6
		Task	81	21.0	14.9	7.7	9.4
		Ratings	80	6.3	13.3	11.6	15.0
63B	General Soldiering	Direct	49	8.4	6.9	16.3	18.6
		Task	50	23.0	14.6	11.0	12.1
63B	Basic Maintenance	Direct	49	12.6	12.8	11.0	10.5
		Task	50	6.0	7.4	34.4	20.8
		Ratings	49	4.4	16.3	8.8	12.6
71L	General Soldiering	Direct	47	10.7	10.5	10.7	9.7
		Task	51	18.9	12.6	11.9	11.6
71L	Typing	Direct	47	8.1	5.5	12.0	13.8
		Task	51	35.7	15.6	7.3	7.6
		Ratings	52	10.8	14.7	9.2	12.2
71L	Filing	Direct	47	10.3	13.0	10.8	14.4
		Task	50	35.7	18.7	8.0	7.9
		Ratings	52	4.6	12.4	4.8	5.6

COMPUTERIZED ADAPTIVE SCREENING TEST

MICHAEL RUMSEY
ARMY RESEARCH INSTITUTE

233 COMPUTERIZED ADAPTIVE SCREENING TEST

WHY CAST?

- Predicts Performance on AFQT
- Pre-Screen for Recruiter's Use
- FORMAT: Computerized and Adaptive
  - Items Tailored to Ability Level
  - 15 Minutes Versus 45 Min for Written Test
- CONTENT: Word Knowledge and Arithmetic Reasoning

BACKGROUND

- Enlistment Screening Test Developed for ASVAB Prediction
- CAST Developed to
  - Decrease Testing Time
  - Decrease Administrative Burden
- CAST Validation Efforts - AFQT Criterion

Investigation	R
- Sands and Gade (1983)	.85
- Pliske, Gade and Johnson (1984)	.80
- Knapp and Pliske (1985)	.79

WHY "FIX" CAST?

- NOT BROKEN, BUT
  - Needed Expanded Item Bank
  - Needed Better Feedback Format
  - Needed Prediction Accuracy "Where It Counts"
  - Needed Capability to Add Experimental Items

WHAT WAS DONE

- Item Bank
  - Expanded
  - Better Distribution
- Feedback
  - Not just a "Point Estimate"
  - Chances of Falling in Key Score Ranges
- Prediction Accuracy
  - More Items at Important Difficulty Levels
  - Critical Points: 30th and 50th Percentiles
- Experimental Items Accomodated by Software Revision

CURRENT STATUS

- WORKING WITH RECRUITING COMMAND
- ON IMPLEMENTATION
- SOME SCORE REPORTING ISSUES REMAIN

IMPLEMENTING SPECIAL SCREENING TESTS

CLINTON WALKER
ARMY RESEARCH INSTITUTE

237 IMPLEMENTING SPECIAL SCREENING TESTS

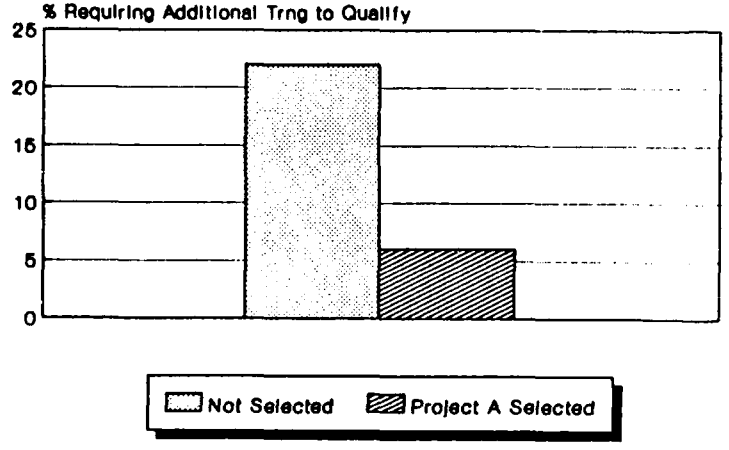
S3 (SKILLS SELECTION AND SUSTAINMENT) PROGRAM

- Dec 87 Implementation directed
- Feb 88 Pilot phase starts at Benning, Knox, Bliss
- May 88 Operational use starts at Benning
- Jul 88 Operational use deferred at Bliss
- Jul 88 V Corps (USAREUR) agrees to testing
- Oct 88 Operational use starts at Knox
- Oct 88 Testing starts in USAREUR
- Feb 89 Pilot of expanded battery to starts at Sill

FORT BENNING: 11H TOW GUNNERY

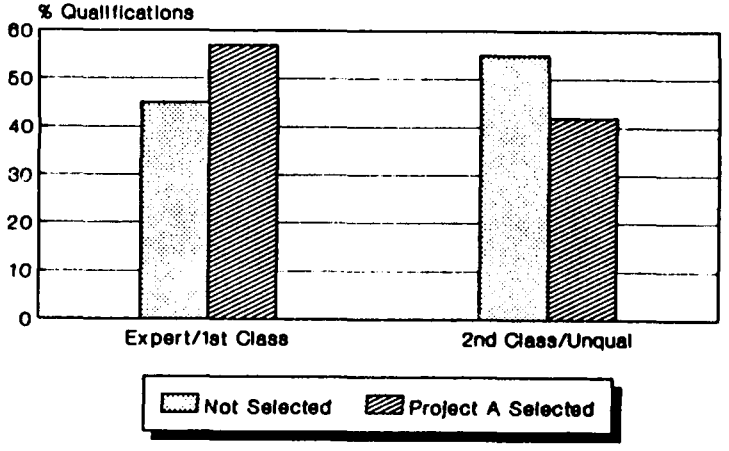
Project A Improvements to TOW Gunnery

Reductions in Training Requirements



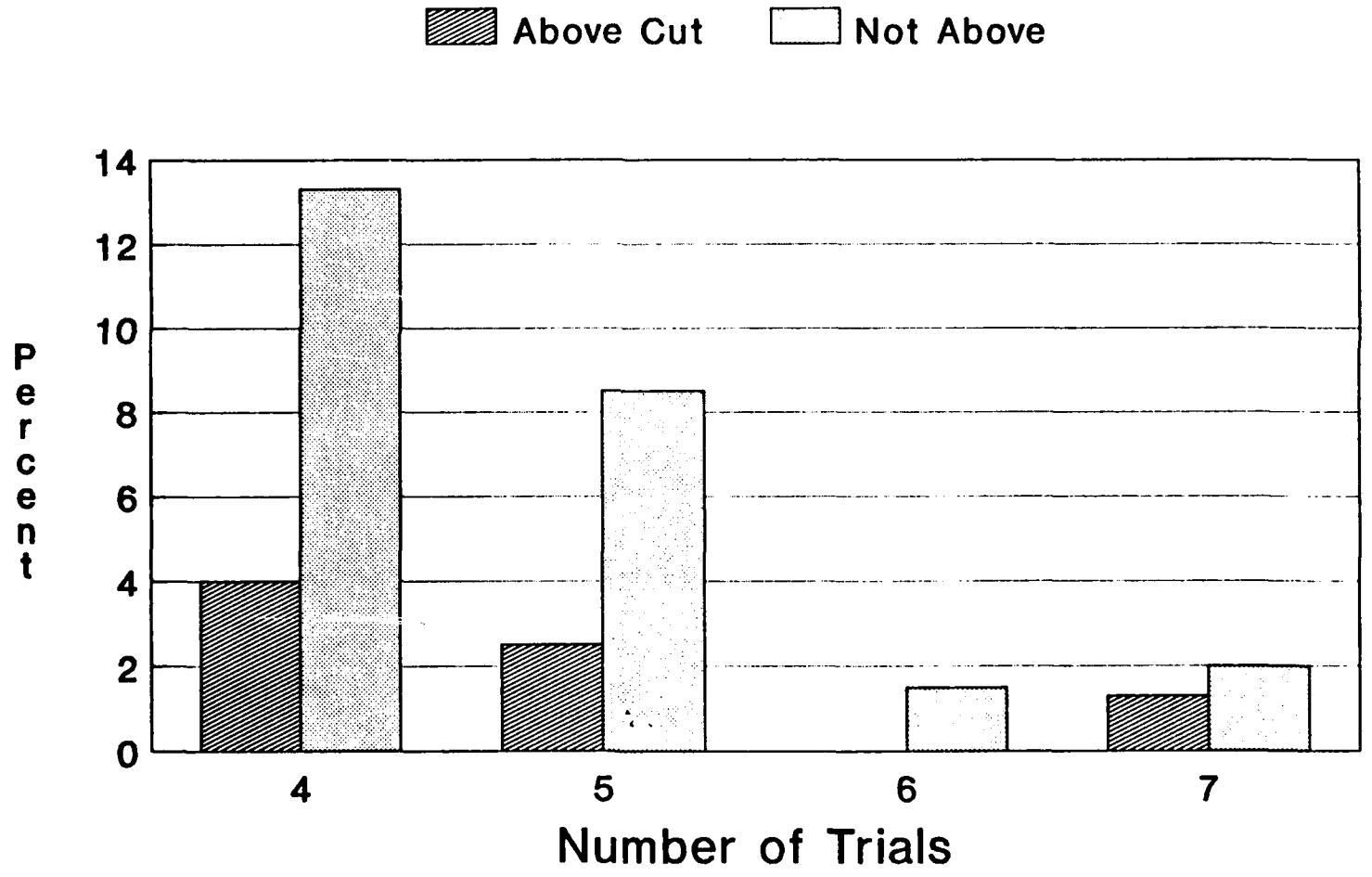
Source: ARI, May 1988

Increases in Performance



Source: ARI, May 1988

Percent of 11H Requiring More Than 3 Tables to Qualify by PScomp Cut = 60



S3: TOW GUNNERY AT BENNING
Correlations of Predictors and Criteria

Predictors	Performance Measures			p
	First Test Trial	Score of Record	# of Tables to Qualify	
Spatial/ Psychomotor	.37	.27	-.23	.0001
ASVAB GT	.29	.15	-.22	.007
Multiple R	.38	.28	-.28	.0001

Note: N = 326

11H TOW GUNNERY: LIVE-FIRE EXERCISE

Who: 60 11H trainees selected by pre-existing methods

Task: Fire one TOW at moving target at ~ 2,000 yards

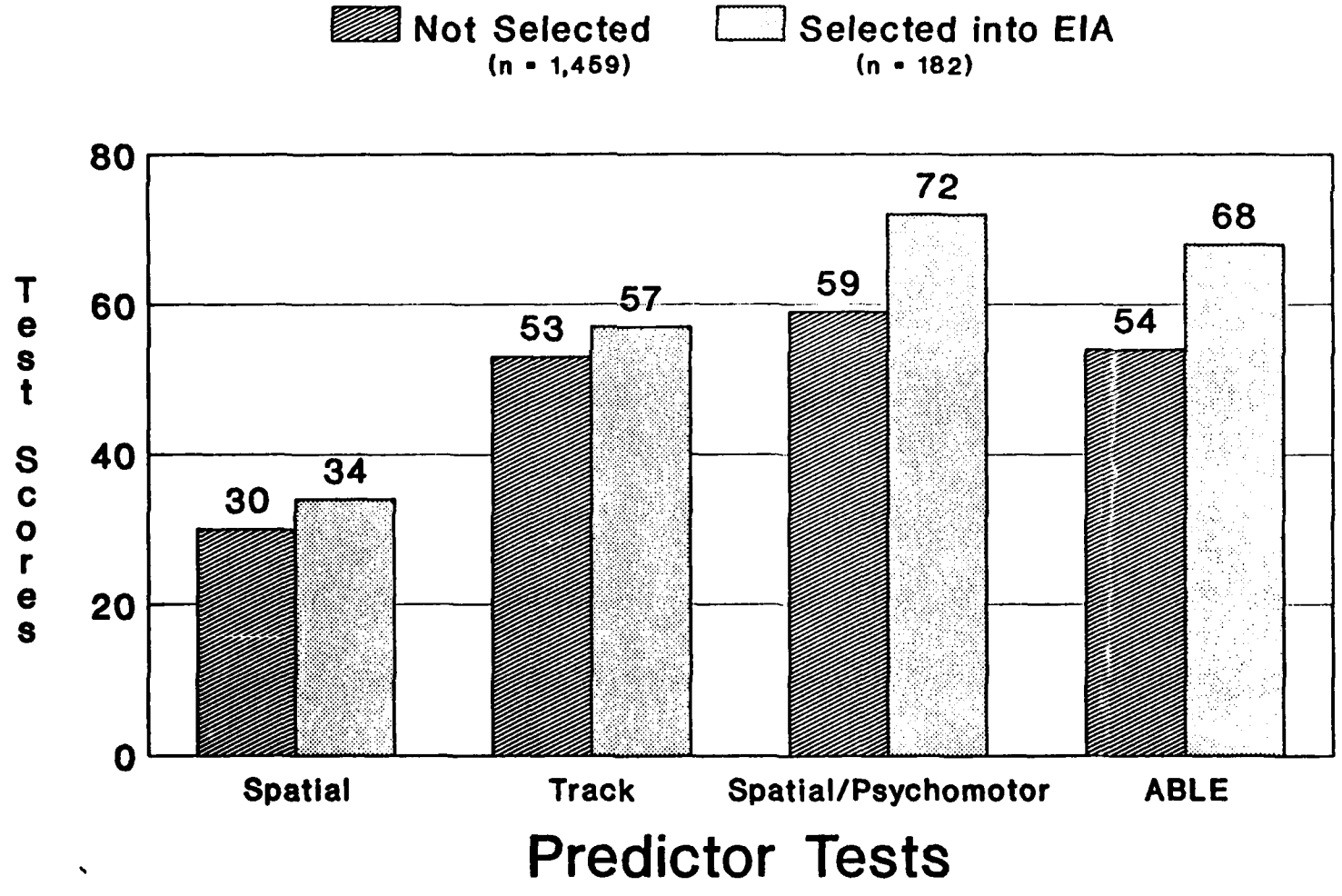
Results:

	Hit rate
> 59th percentile on spatial/psychomotor	85
	80 = mean
=< 59th percentile	74

FORT KNOX: EXCELLENCE IN ARMOR

19K TANK CREW MEMBERS

S3 - ALL ARMOR MOSs

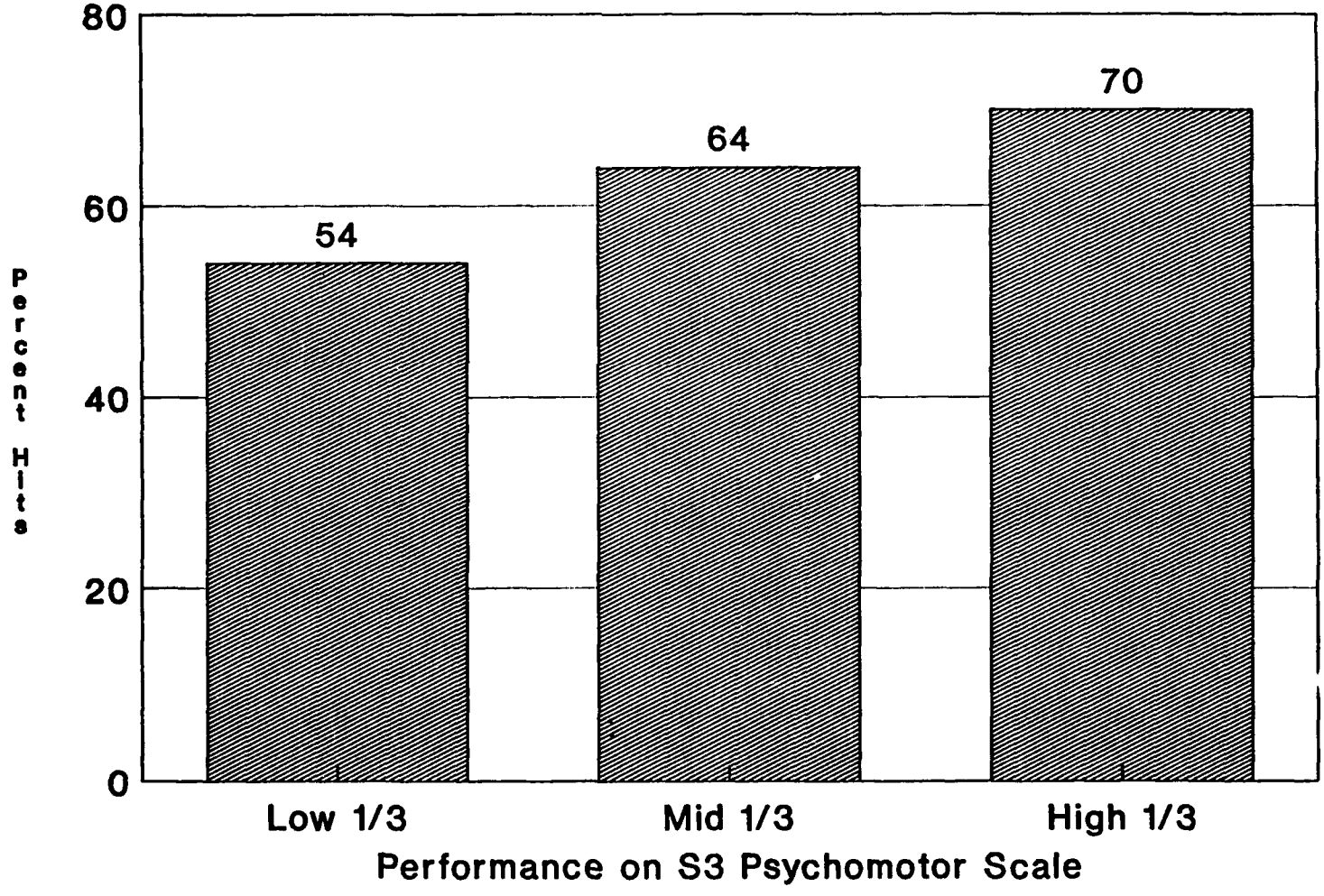


FORT KNOX: TANK GUNNERY
Correlations With Speed/Accuracy Outcome

Predictor	r
Spatial/Psychomotor	.54
GT	.34
Spatial	.40
Tracking	.46
I-COFT Training Scores	.48
ABLE	.11

Note: N = 496

S3 ICOFT PERFORMANCE



STEPWISE REGRESSIONS ON SPEED/ACCURACY OUTCOME

Predictors	Multiple R
Excluding S3 predictors	
I-COFT Training Scores	.48
ASVAB GT	.52
Including all Variables	
Spatial/psychomotor	.54
I-COFT Training Scores	.59
Pre-training predictors	
GT	.34
Spatial/psychomotor	.55

S3 AT FORT BLISS

16P and 16S Air Defense Artillery

S3 PILOT AT FORT BLISS

Outcomes to date

- Small n's (26 16P and 75 16S)
- Much missing data
- Crew, rather than individual, performance
- Results not consistent
- Further pilot planned with other predictor and performance measures

S3 AT KNOX: OUTCOME OF PILOT

- ABLE and spatial/psychomotor scores are now being provided to decision makers. Use is discretionary.

- Research is continuing into cases where new tests and old selection methods disagree

IMPLEMENTATION IN USAREUR

Objective:	**Help select for gunner's seat in Bradley**
Steps:	**Install S3 testing package in 3rd Armor Div**
Status:	**Testing has started, and sequence of events for selection is being worked out**

S3/USAREUR: NEXT STEPS

- Monitor data periodically
- Pilot modified/expanded battery at Sill and Bliss
- Work for implementation of spatial/psychomotor tests in the MEPS

IMPLEMENTATION AT FORT SILL

- Test MOS 13F, Fire Support Specialist
- Select tests for expanded battery by 15 Dec 88
- Start six-month pilot Feb 89

NEXT IMPLEMENTATION
SELECTION INTO TRAINING FOR SPECIAL FORCES

- PROBLEM: Attrition from special forces training is high due to failures in land navigation
- SOLUTION: Select into Special Forces training with spatial tests from Project A
- DETAILS: Now (Dec 88) being worked out

THE AIR FORCE PROGRAM

MAJOR FRANK T. VACARRO, USAF
HQS AIR FORCE SYSTEMS COMMAND

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE SYSTEMS COMMAND
ANDREWS AIR FORCE BASE DC 20334-5000

REPLY TO ATTN OF XTH

19 Dec 88

SUBJECT Information for Dr Alluisi on funding in PE 0602205F

TO SAF/AQT (Lt Col Higgins)

1. As of 9 Nov 88, AFHRL was scheduled to receive the following funds in Program Element 0602205F for FY 89 thru FY 94:

	FY 1989	FY 1990	FY 1991	FY 1992	FY 1993	FY 1994
a. HRL/OT Flying Training Simulators, Part-Task Trainers (strong TAC support). Projects 1123, 1192, 6114	9464	8594	8537	9958	9758	9855
b. HRL/LR Logistics and Command & Control Training (strong AFLC and PACAF support). Projects 1710 & 3017	5035	4513	4484	4957	4975	5050
c. HRL/ID Computer-based Training, Training Decision Aids, Basic Job Skills (strong ATC support, reasonably strong TAC support). Projects 1121 & 7734	2950	2789	2778	3245	3126	3200
d. HRL/MO Selection, Classification, Assignment, Manpower & Force Models, Job Performance Measures, MPT Integration (IMPACTS) Tools (strong ATC & AF/DP support). Project 7719	3370	3034	3031	3397	3320	3400

2. While actual program reductions/cancellations as a result of the $1.8M PBD action have not yet been finalized, the basic approach will be to target those efforts most closely related to the ASVAB R&D. Thus, the bulk of the reductions will be in the MO division. It now appears that the six manpower slots will also be taken from PE 0602205F.

a. MO is responsible for the following programs which will be impacted by PBD 033C. Some efforts, such as the aircrew selection & classification and the MPT Integration tools, are responding to major Air Force requirements and must continue to be funded. (* Indicates efforts likely to be cancelled.)

*ASVAB	400	435	300	200	200	200
*AFOQT/other	71	100	100	100	50	50
*Learning Abilities Meas.	375	541	656	670	284	280

Basic Job Skills	732	144				
Person-Job Match	100	225	200			
Occupational Measurement	200	250	250	250		
Aircrew Selection & Classif	614	464	435	435	405	500
MPT Integration Tools	463	600	1255	1000	740	220

b. Additionally, the Job Performance Measurement effort managed by the ID division, which is determining the links between ASVAB and job performance will likely be significantly reduced or cancelled.

Job Performance Measures	385	500	600	855	750	600

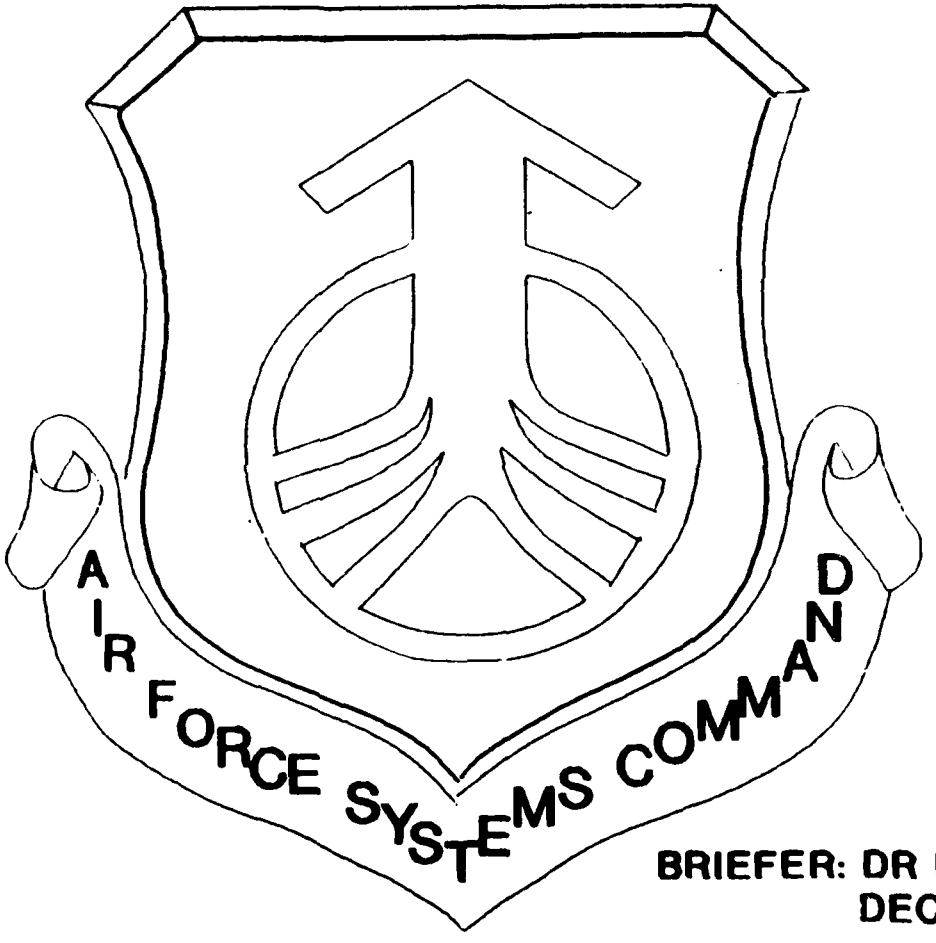
3. The FY90/91 Descriptive Summary does not reflect the likely distribution of the PBD reduction, but rather spreads the reduction across several projects. We expect, based upon the comments of Dr Alluisi and Dr Selman, that some of the funds taken incorrectly by PBD 033C will be restored. A large reduction in project 7719 now followed by a plus up next cycle could draw extra attention from the Congressional staffers and give the impression that we are starting a major new effort. We are also embarking on a major change in the process that we (AFSC) use to determine the investment strategy for MPT efforts. This new process will focus our investment on those technology needs/requirements which the "users" indicate are the most important to them.

FRANK T. VACCARO, Major, USAF
Chief, Personnel, Training & Simulation
Directorate of Combat Support
DCS/Technology & Requirements Planning

ENLISTED SELECTION AND CLASSIFICATION TESTING RESEARCH AND DEVELOPMENT

MALCOLM REE
AIR FORCE HUMAN RESOURCES LABORATORY

ENLISTED SELECTION & CLASSIFICATION TESTING RESEARCH AND DEVELOPMENT



BRIEFER: DR REE
DECEMBER 1988

Enlisted Selection and Classification Testing Research and Development

OUTLINE

- ASVAB Background
- Air Force Role
- ASVAB Programs
- User Coordination
- Joint Service ASVAB R&D 5-Year Plan
- Future Plans

- Summary

ASVAB Background

- Multiple Aptitude Test Battery
  - Consists of 10 Subtests
    - 8 Power
    - 2 Speeded
  - Measures 4 Factors
    - Verbal
    - Quantitative
    - Technical
    - Speed
- Used by all the Services
- Establish Enlistment/Induction Mental Qualifications
- Select for Particular Jobs/Training
- Classify, Assign, and Retraining

ASVAB Background
Current Content

Subtest	Items	Time(Min)	AFQT
General Science	25	11	
Arithmetic Reasoning	30	36	X
Word Knowledge	35	11	X
Paragraph Comprehension	15	13	X
Numerical Operations*	50	3	
Coding Speed*	84	7	
Auto & Shop Information	25	11	
Mathematics Knowledge	25	24	X
Mechanical Comprehension	25	19	
Electronics Information	20	9	
Total	334	144	

*Speeded Subtests

ASVAB Background
1980 Youth Norms

- Previously on 1944 Metric
- New Standardization Base Adopted
  - 1980 Profile of American Youth
  - Administered ASVAB Form 8ax
  - Cluster Sample
  - Over-Sampling of
    - Minorities
    - Economically Disadvantaged Whites
  - Tested Summer Through Fall 1980
  - Speeded Subtest Data Adjustment Necessary
  - Standards Based on 18-23 Year Olds
    - Both Males (4,550) and Females (4,623)
    - Sample Cells Appropriately Weighted (Weighted N = 25,409,021)

Air Force Role

- Executive Agent for ASVAB R&D
- Lead Laboratory is Air Force Human Resource Laboratory
- Joint Service Selection and Classification Working Group
  - Chair of Working Group
  - Member on Policy Task Group
  - Chair of Technical Task Group

ASVAB Programs

- Two Major Programs
- Joint Service Enlistment Testing Program
  - Production Testing (1+ Million/Year)
  - Enlistment Applicants for all Services
  - Testing at 68 MEPS and 900+ METS
- DOD Student Testing Program
  - 1.2 Million HS Students Tested Each Year
    - 10th, 11th, & 12th Graders
    - At 14,'00 High Schools
  - Provides Recruiters "Lead Lists"
  - Provides School Counselor Ability Info
  - Two Composite Score Sets Generated
    - HS Counseling Composites
    - Service Composites
  - Scores Valid for Enlistment for 2 Years

User Coordination

- R&D is Coordinated Quarterly With
  - Joint Service Selection and Classification Working Group
    - Technical Task Group
  - CAT-ASVAB Working Group
    - Technical Committee
    - Future Test Subcommittee
- R&D is Coordinated as Needed
  - Adaptability Screening Committee
- AFHRL-USMEPCOM Frequent Communication

Joint Service ASVAB 5-Year R&D Plan

- Developed/Coordinated by AFHRL
  - Revised Annually
- Coordinated With Services and USMEPCOM
- Approved by the MAP Annually
- Plan's Major Categories Are:
  - Test Development/Test Equity
  - Validation Studies
  - Norming and Equating
  - DOD Student Testing Program
  - Development of New Measures
  - Miscellaneous

Joint Service ASVAB 5-Year R&D Plan
Test Development/Test Equity

Support Takes Many Forms Including R&D and Operational Products

- Development of New Forms
  - Operational Program
    - Six Forms
    - 4-Year Implementation Cycle
    - 5-Year Development Cycle
  - DOD Student Testing Program
    - Four Forms
    - 5-Year Implementation Cycle
    - 5-Year Development Cycle
  - Coordinated With User Quarterly

JOINT SERVICE ASVAB 5-YEAR R&D PLAN
TEST DEVELOPMENT/TEST EQUITY

- OPERATIONAL PROGRAM SUPPORT
  - DELIBERATE FAILURE KEYS
    - -- IN THE EVENT OF MOBILIZATION
    - -- DETECTS THOSE WHO TRY TO AVOID MILITARY SERVICE
  - PSEUDO AFQT
    - -- ASSESSES TEST COMPROMISE
    - -- USED BY EACH SERVICE TO IDENTIFY RECRUITER MISCONDUCT
    - -- NOT USED TO IDENTIFY INDIVIDUALS FOR RETESTING

JOINT SERVICE ASVAB 5-YEAR R&D PLAN
TEST DEVELOPMENT/TEST EQUITY

- OPERATIONAL PROGRAM SUPPORT (CONT'D)
  - SHORT TERM STUDIES
    - -- TEST EQUITY
    - -- ITEM BIAS/SENSITIVITY
  - TEST EQUITY CONFERENCE
    - -- NEW CONCEPTS IN TEST EQUITY/BIAS
    - -- PRACTICAL ISSUES & APPLICATIONS AS WELL AS THEORY

JOINT SERVICE ASVAB 5-YEAR R&D PLAN

- STUDENT TESTING PROGRAM
  SUPPORTING THE PROGRAM WITH BOTH
  R&D AND PRODUCTS
  - SUPPORT DOCUMENTS
    -- TEST MANUAL
    -- COUNSELOR'S MANUAL
    -- TECHNICAL SUPPLEMENT
  - SUPPORT STUDIES
    -- ITEM BIAS STUDIES
    -- TEST BIAS STUDIES

Joint Services ASVAB 5-Year R&D Plan

- **Validation Studies**
  ASVAB is validated for several uses
  - **Operational validation**
  - **Factorial validity**
  - **Validity Generalization**
  - **Educational Validations**

Joint Services ASVAB 5-Year R&D Plan

- **Norming and Equating**
  Research to Refine Equating Techniques
  - **Censored Sample Equating**
  - **Enhancements to Operational Procedures**
    - **Mathematical Algorithms**

Joint Services ASVAB 5-Year R&D Plan

- DoD Student Testing Program
  Research to Support Efficacy for Counseling
  - High School Equity/Validity
  - Industrial Validation
  - Vocational Validation

Joint Service ASVAB 5-Year R&D Plan

- **Development of New Measures**
  New Tests or Measures to Replace Existing Subtests or Augment ASVAB
  - **Biodata Measures for Leadership**
  - **New Paper and Pencil Tests**
  - **Lamp Validation Studies**
  - **Development of Validation Strategy**

Joint Services ASVAB 5-Year R&D Plan

- **Miscellaneous**
  Efforts which Support R&D or Facets of Operation
  - **Archive Development**
  - **Operational Report**
  - **Appropriateness Measurement**
    - **Compromise**
    - **Deliberate**

Studies in Planning Phase

- **Efforts in Evolution Toward Formal Adaption**
  - **Validation of Additional LAMP Tests**
  - **Evaluation of USAF Composites**
  - **Mathematics of Score-Profile Differences**
  - **Evaluation of New Commercial Test Types**

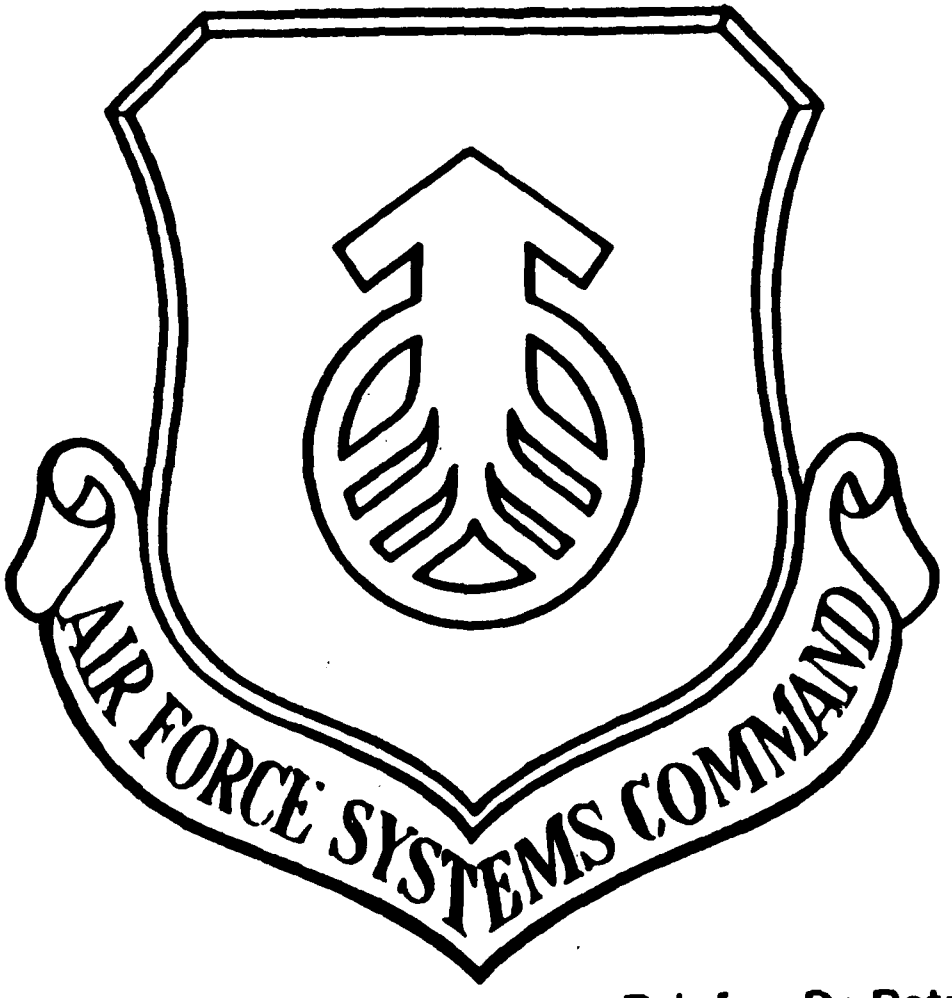
Summary

- Air Force as Executive Agent Provides Coordinated 5-Year R&D Plan
  - Operational Program
  - Student Testing Program
- Coordinates with USER Quarterly
  - AF/DPXOA
  - HQ USMEPCOM

LEARNING ABILITIES MEASUREMENT PROGRAM

PATRICK KYLLONEN
AIR FORCE HUMAN RESOURCES LABORATORY

Learning Abilities Measurement Program



Briefer: Dr Patrick Kyllonen

Present R&D Program Status
Background

- **The Problem**
  - -Current aptitude tests result in many
    - --"misses": Good candidate is passed over
    - --"false alarms": Bad candidate is chosen
  - -Result
    - --missed opportunities
    - --attrition
    - --high training costs
    - --on the job performance failures

- **Source of the Problem**
  - -Psychology Gap
    - --No basic research since WWII
    - --Aptitude testing not driven by current models
  - -Technology Gap
    - Gap between...
    - --What jobs require (high technology)
    - --What tests measure (low technology)

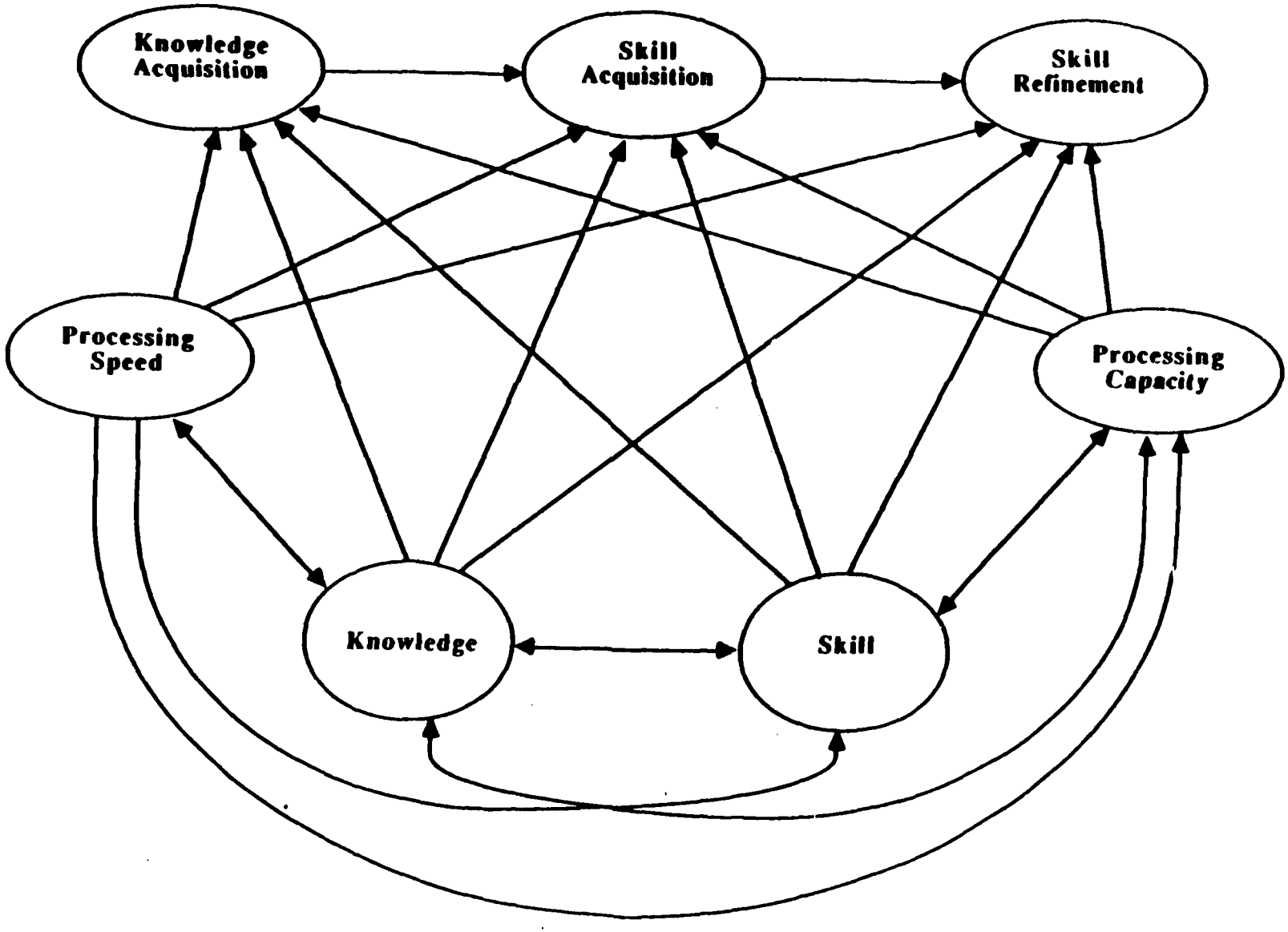
Present R&D Program Status
Background

- **Bridging the Psychology Gap**
  - **-Event: Cognitive Science emerges in the 70s & 80s**
  - **-Capitalizing:**
    - **--Base aptitude tests on cognitive science**
    - **--Model aptitude-learning outcome-performance links**
- **Bridging the Technology Gap**
  - **-Event: Microcomputers become affordable (1980)**
  - **-Capitalizing: Use microcomputers for**
    - **--aptitude testing**
    - **--training and simulated job performance testing**

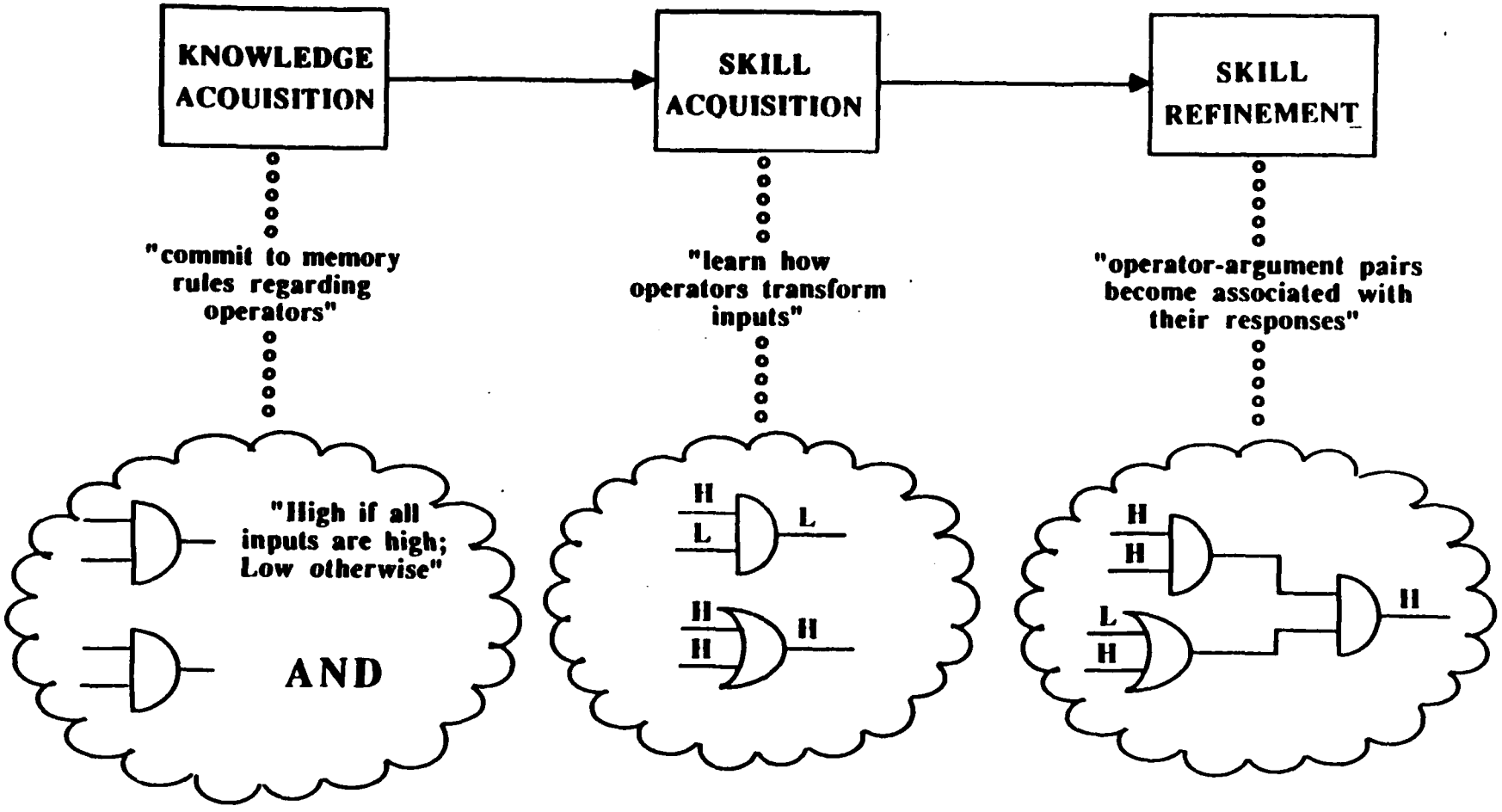
Present R&D Program Status
Approach

- Aptitude Testing
  - What are the basic ability factors?
  - How do we measure them?
- Learning Outcome Assessment
  - What are the learning & performance factors?
  - How do we measure them?
    (i.e., What are indicators of learning/performance success?)
- Aptitude-Learning Outcome Relations
  - How well do ability factors predict after-training performance?
  - Compare LAMP ability factors' predictive value against --ASVAB, BAT, AFOQT

Present R&D Program Status
Four-Sources Framework



Present R&D Program Status
Model of the Development of Cognitive Skill



Present R&D Program Status
Conclusions from a Validity Study

- **Modeling acquisition of cognitive skill is new territory**
- **LAMP models (for logic gate learning) worked remarkably well**
  -- Multiple correlation = .75
- **LAMP models improve prediction over ASVAB**
  -- Multiple correlation (ASVAB) = .55
  -- Multiple correlation (+ LAMP) = .75

Accomplishments
Facilities

- Established Aptitude Data Collection Facility
  - Goal: Setting for developing new aptitude tests
  - Name: Cognitive Abilities Measurement (CAM) laboratory
  - Consists of: 36 computer test stations (LAFB, bldg 5320)
- Developed prototype CAM computerized test battery
- Established Training Data Collection Facility
  - Goal: Testbed for validating new aptitude tests
  - Name: Complex Learning Assessment (CLASS) laboratory
  - Consists of: 30 computer training stations (LAFB, bldg 9016)
- Developed prototype CLASS courses for validation studies

Accomplishments
Facilities

- **Building 578 Annex**
  - -- **Function:** Houses contractors & programmers
  - -- **Scheduled Completion:** FY89
  - -- **Capacity:** 24 workers (18 AFHRL/MO)
- **Military Construction Program (MCP)**
  - -- **Function:** Single roof encompassing all LAMP
  - -- **Schedule:** Brooks Facility Review Meeting (Feb 89)
  - -- **Support from:**
    - -- Lackland AFB Civil Engineering
    - -- Capt Grivich (.5 time)

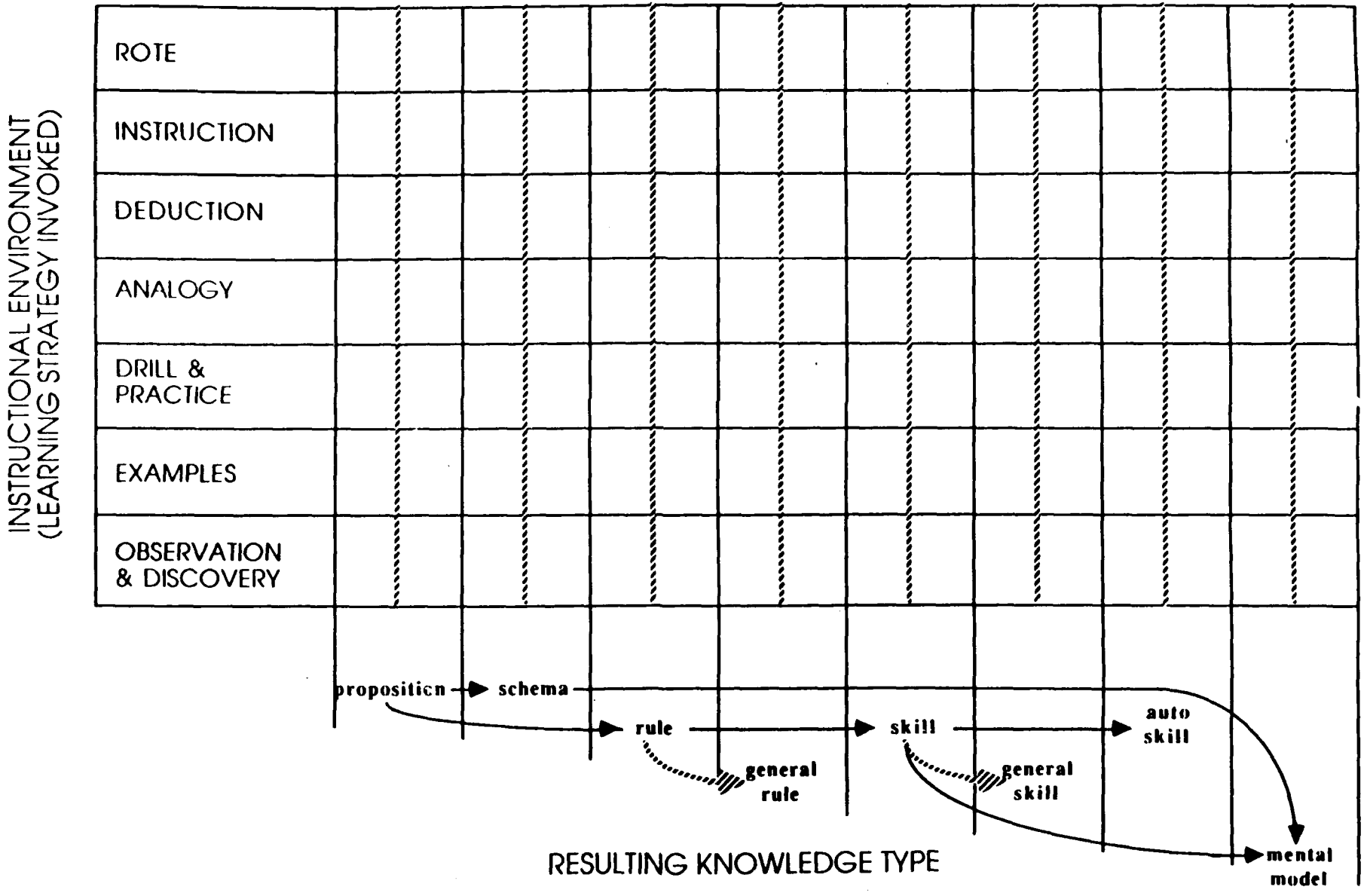
Accomplishments
Publications

	in prep	in press	published
Refereed Journal	12	1	6
Book Chapters		8	8
Technical Papers/Reports		2	5
Conference Papers		10	53
TOTAL	12	21	72

Future Plans
Basic Research

- **Spatial skills assessment**
  - -- Spatial knowledge, spatial working memory
  - -- Dynamic & temporal spatial skills
- **Modeling the acquisition of very complex skills**
  - -- Computer programming (N = 80, so far)
  - -- Electronics troubleshooting
- **Taxonomy of Learning Skills**
  - -- Learning abilities as a function of the 4 sources
  - -- Taxonomy as a guide to task analysis
- **Parameters of Processing Capacity**
  - -- Momentary vs. Temporal capacity
  - -- Processing capacity vs. probability of creating/strengthening a memory trace

LEARNING ABILITIES TAXONOMY



Future Plans
Technology Transition Planning

- Definition
  - tests developed under 6.1 are validated under 6.2
    - -- enlisted selection
    - -- officer selection
- Enlisted Validation Efforts
  - Current: Security Police study
  - Future: Various initial skills courses
- Officer Validation Efforts
  - Future: Undergraduate Pilot Training (UPT) study

Future Plans
Bottom-line Factors

- Criteria for Success
  - As a basic research program
    - -- continued support from AFOSR (vs. 6.1 monies to Universities)
    - -- publish findings in scientific literature (need to increase publication rate)
  - As an applied research program
    - -- direct contributions (batteries) to BAT, CAT-ASVAB, AFOQT, etc.
    - -- indirect contributions (models) to training systems (ID), workload assessment

FUNDING FOR NAVY PROGRAM

JOHN J. PASS
NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER

FUNDING
($K)

	FY89	FY90	FY91	FY92	FY93
Civilian Personnel	326	335	335	335	335
Contracts					
• SDSUF Students	101	100	100	100	100
• Practice/Coaching of Working Memory Tests (6.2)		90			
• Components of G (6.2)		100			
• Incremental Validity Methodology (6.3)		100			
• School Validity (6.3/O&M)	300	120			
• Reliability Studies of New Tests (6.2)			100		
• Process Measures vs Working Memory (6.2)			100		
• Adaptive Test Development (6.3/O&M)			100		
• Validation of Second Generation Tests (6.2)				400	400
TOTAL	727	795	735	835	835

ACCELERATED CAT-ASVAB PROJECT

WILLIAM A. SANDS
NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER

ACCELERATED CAT-ASVAB PROJECT

W. A. Sands
Officer-in-Charge
CAT-ASVAB Program

Briefing for the
Topical Area Review
Testing R&D and Planned Applications to
Enlisted Personnel Selection and Classification
8 - 9 December 1988

OVERVIEW

- Introduction
- CAT History
- ACAP Background
- ACAP Field Activities
- Advantages
- Conclusion

CAT-ASVAB Program

Objectives

- Develop a Computerized Adaptive Testing version of the Armed Services Vocational Aptitude Battery (CAT-ASVAB)

- Develop a microcomputer-based CAT-ASVAB delivery system

- Evaluate CAT-ASVAB as a potential replacement for the paper-and-pencil version of the battery (P&P-ASVAB)

Armed Services Vocational Aptitude Battery (ASVAB)

- Used by all services for qualification and classification decisions
- Consists of 10 subtests: 8 power, 2 speeded
- Has 6 parallel forms
- Lasts 3.5 hours
- Administered over 1 million times yearly

Armed Services Vocational Aptitude Battery

(Forms 11, 12 & 13)

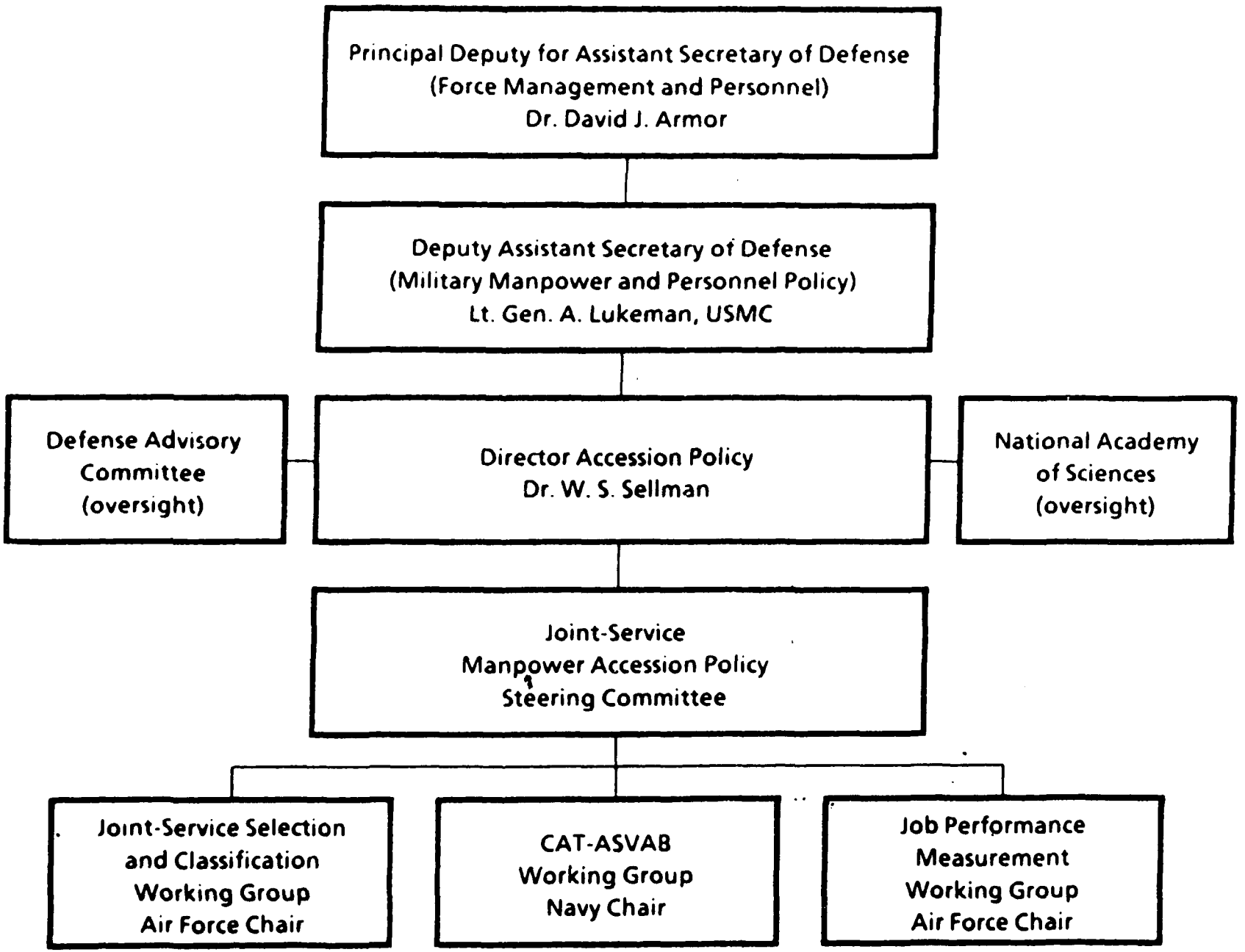
- General Science
- Arithmetic Reasoning
- Word Knowledge
- Paragraph Comprehension
- Numerical Operations
- Coding Speed
- Auto & Shop Information
- Mathematics Knowledge
- Mechanical Comprehension
- Electronics Information

Computerized Testing Systems

Roles

CAT-ASVAB Program:

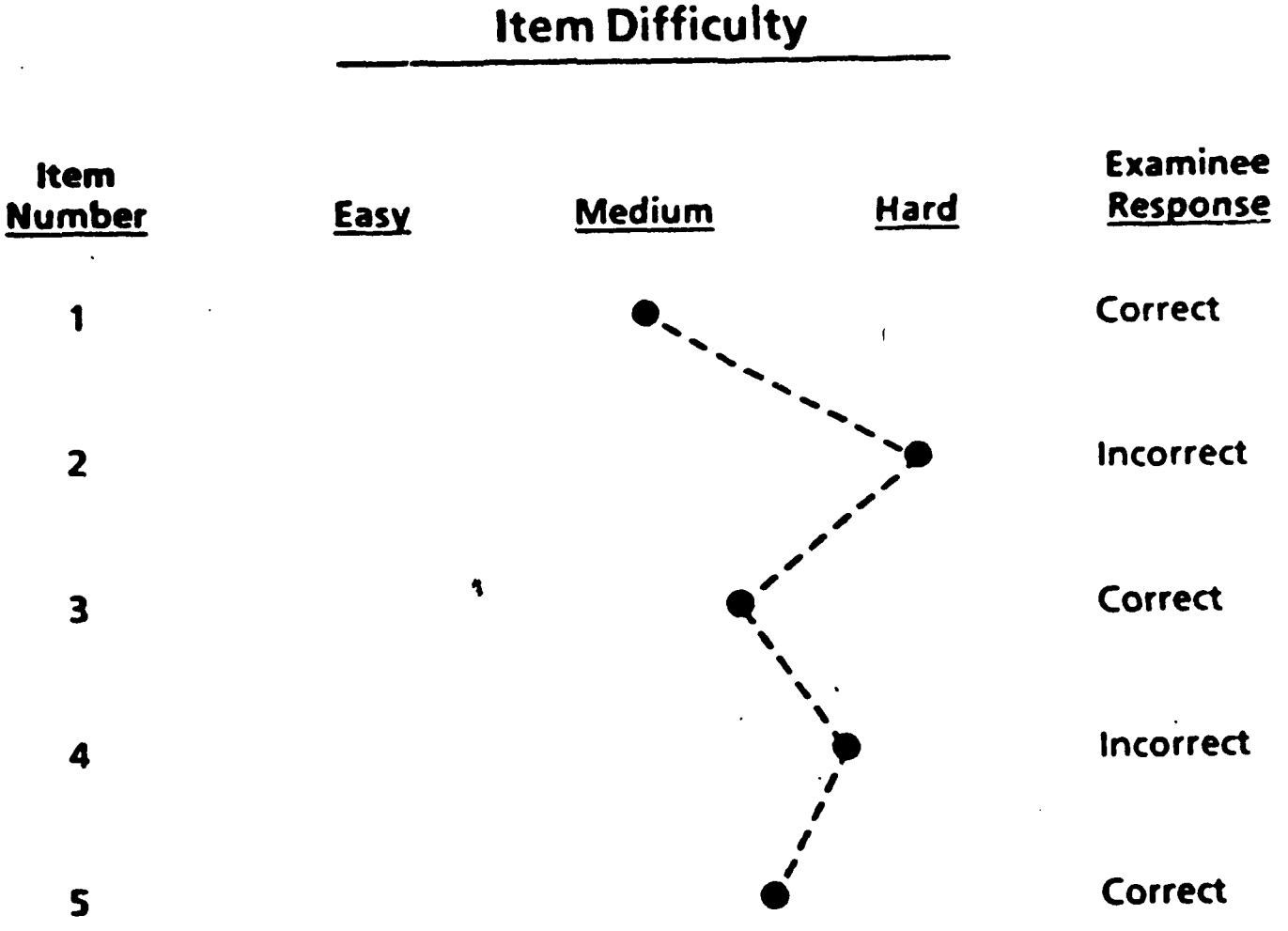
- DoN - Executive Agent
- Navy - Lead Service
- NPRDC - Lead Laboratory


Principal Deputy for Assistant Secretary of Defense
(Force Management and Personnel)
Dr. David J. Armor
Deputy Assistant Secretary of Defense
(Military Manpower and Personnel Policy)
Lt. Gen. A. Lukeman, USMC
Defense Advisory
Committee
(oversight)
Director Accession Policy
Dr. W. S. Sellman
National Academy
of Sciences
(oversight)
Joint-Service
Manpower Accession Policy
Steering Committee
Joint-Service Selection
and Classification
Working Group
Air Force Chair
CAT-ASVAB
Working Group
Navy Chair
Job Performance
Measurement
Working Group
Air Force Chair

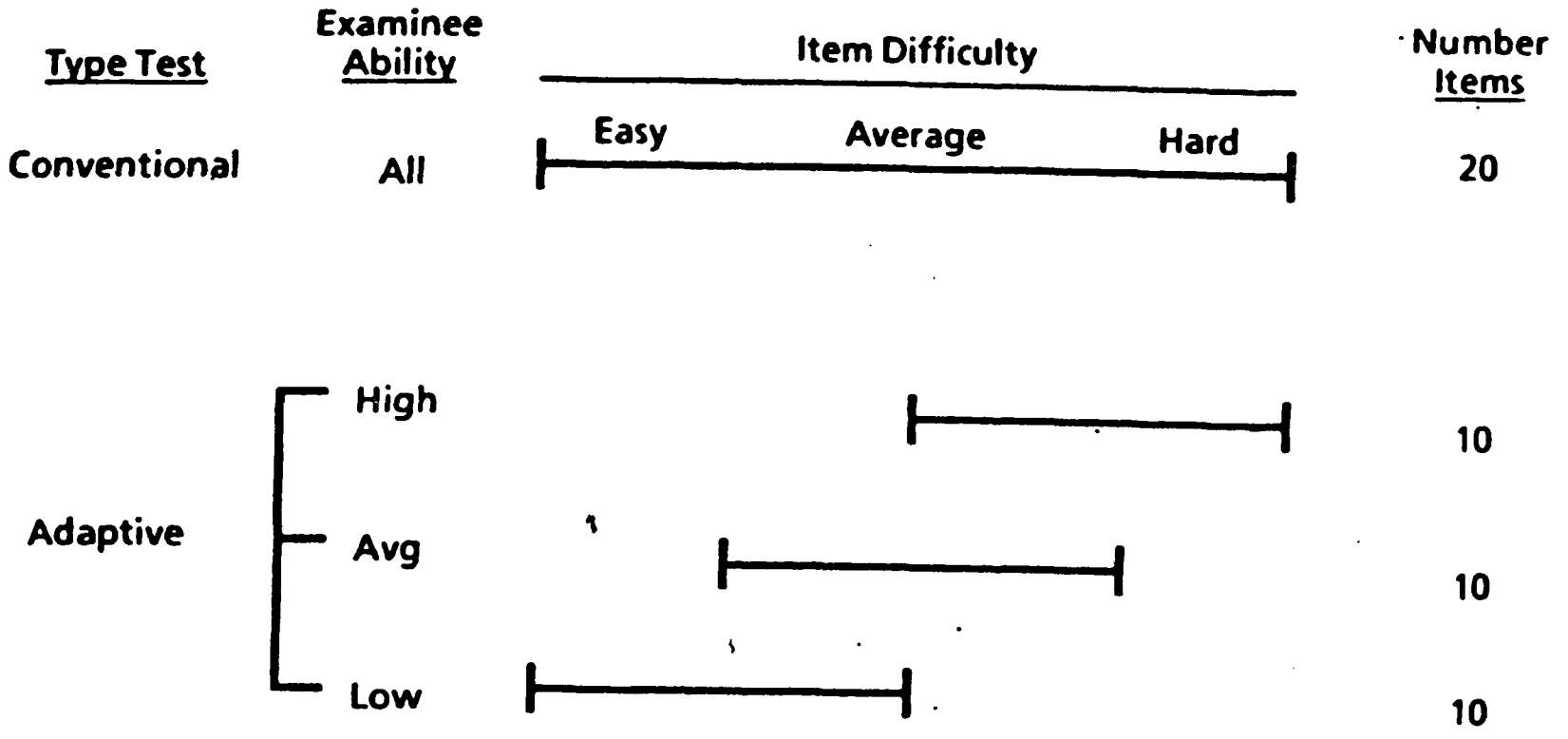
Differences Between Conventional and Adaptive Testing

- Administration Mode
- Items Administered

Illustrative Five Item CAT Test



Utilization of Test Items



CAT HISTORY

- 1950s
  - Adaptive Testing Idea Proposed
- 1960s
  - Psychometric Research Sponsored by ONR
  - Early Experiments in CAT by ARI (APRO)
- 1970s
  - Continued Research Sponsored by ONR
  - Experiments with CAT by NPRDC (NPTRL)
  - Prototype Device Developed by ARI
  - U.S. Civil Service Commission (USCSC) Development of a CAT Version of the Professional and Administrative Career Examination (PACE)
  - Joint Sponsorship of First Major CAT Conference by ONR and USCSC

CAT HISTORY
(continued)

- 1970s (continued)
  - Joint Service Meeting on CAT at ARI
  - ASN/OASD Evaluation of CAT Feasibility
  - Joint Service CAT-ASVAB Program Initiated
    - DON - Executive Agent
    - Marine Corps - Lead Service
    - NPRDC - Lead Laboratory
    - CAT Inter-Service Coordinating Committee Established

CAT HISTORY
(continued)

- 1980s
  - Continued Research Sponsored by ONR
  - Three-Stage System Development Strategy
  - Lead Service Role Transferred to Navy
    - Officer-in-Charge Designated at NPRDC
    - Program Management Office Relocated to NPRDC
  - Accelerated CAT-ASVAB Project (ACAP)
  - Joint-Service CAT-ASVAB Validity Study
  - Cost-Benefit Analyses Study Performed
  - Extended Computerized Adaptive Testing (ECAT) Project
    - ECAT POA&M Written
    - Emphasis on New Predictors to Augment ASVAB Tests

CAT SYSTEM DEVELOPMENT

PHILOSOPHY

- Conservative Design Approach
- Demonstrable Technology Emphasis
- Lowest Cost Consistent with Performance
- Minimal Development Risk

APPROACH

- Previous Approach
- Incentives for Change in Approach
- New Approach

PREVIOUS APPROACH

- Private Industry Contracts
- Three Stage Competitive "Flyoff"
  - Stage 1 - Develop System Design Concepts & Supporting Analyses
  - Stage 2 - Develop, Field Test, & Evaluate Limited Production Models
  - Stage 3 - Full Scale Production, Deployment, & Implementation

INCENTIVES FOR CHANGE IN APPROACH

- Contractors' Timelines
- Microcomputer Technology Advances
- Military Testing Association Keynote Address (Munich, Nov 1984)

NEW APPROACH

- Accelerated CAT-ASVAB Project (ACAP)
- Full Scale CAT-ASVAB

Accelerated CAT-ASVAB Project (ACAP) Field Activities

- Pre-Test
- Medium of Administration
- Cross-Correlation
- Preliminary Operational Check
- Score Equating Development
- Score Equating Verification

Pre-Test

Description

- Purpose: Evaluate Human-Computer System Interaction
- Subjects:
  - Recruits, Before Entering Training (N = 231)
  - High School Students (N = 73)
- Measures:
  - ACAP Battery--Administered on HP-IPC Microcomputers
  - Questionnaire
  - Systematic Interview
- Example Results:
  - Perceived Benefits: Faster, Easier, Self-Paced, Less Writing
  - Perceived Drawbacks: Cannot Go Back, Eyes Became Tired
  - Other: Instructions Revised

PRETEST

STATUS

- Completed--Nov 86

Medium of Administration

Description

- Purpose: Evaluate Effect of Calibration Medium of Administration on Score Precision
- Subjects: Recruits at Navy Recruit Training Center (N = 3000)
- Measures: 40 Item Conventional Tests for GS, AR, WK, PC, and SI
- Procedures: Random Assignment to One of Three Groups
  - Type Administration (Linear--Ascending Difficulty):
    - Group 1--Computer Administration
    - Group 2--Paper-and-Pencil Administration
    - Group 3--Computer Administration
  - Use:
    - Group 1--Obtain Computer-Based Calibration
    - Group 2--Obtain Paper-and-Pencil Based Calibration
    - Group 3--Each Calibration Used to Estimate Ability

Medium of Administration

Status

- Phase I--Data Collection Completed
  - Four Tests
    - General Science
    - Arithmetic Reasoning
    - Word Knowledge
    - Shop Information
  - Sample Sizes
    - Computer: N = 1989
    - Paper-and-Pencil; N = 983
  - Analyses Underway
- Phase II--Paragraph Comprehension and Mechanical Comprehension Under Consideration

Cross-Correlation

Description

- Purpose: Compare CAT-ASVAB and P&P-ASVAB Precision
- Subjects: Recruits at Navy Recruit Training Center (N = 1250)
- Measures:
  - Operational P&P-ASVAB (Forms 11A, 11B, 12A, 12B, 13A, and 13B)
  - Non-Operational CAT-ASVAB (Two Forms)
  - Non-Operational P&P-ASVAB (Forms 9B and 10B)
- Procedures: Operational P&P-ASVAB Taken Before Enlistment
  - Group 1--CAT-ASVAB Form 1, Then CAT-ASVAB Form 2
  - Group 2--P&P-ASVAB Form 9B, Then P&P-ASVAB Form 10B
  - Second Test: About 5 Weeks After First Test

Cross-Correlation

Status

- First Test Phase--Completed
  - CAT-ASVAB: N = 1093
  - P&P-ASVAB: N = 1070
- Retest Phase--Completed
  - CAT-ASVAB: N = 786
  - P&P-ASVAB: N = 761
- Data Base Development
  - Under Construction
  - Analyses--Scheduled Start Nov 1988

Preliminary Operational Check

Description

- **Purpose: Demonstrate Communications Interface Between the ACAP System and the USMEPCOM System**

- **Location: Seattle Military Entrance Processing Station**

Preliminary Operational Check

Status

- Test: Performed Jointly by NPRDC and USMEPCOM Personnel
- Data:
  - Examinees: 31
  - Sessions: 5
- Procedure:
  - Data Loaded on Data Handling Computer
  - Data Transferred to System-80 Minicomputer
- Results: 100% Accuracy
- Plans:
  - Merge and Edit ACAP Results on System-80
  - Telecommunicate ACAP Results to USMEPCOM Headquarters

Score Equating Development

Description

- Purpose: Equate CAT-ASVAB with P&P-ASVAB
- Subjects: Military Service Applicants at Six MEPS/METS (N = 7500)
- Measures:
  - Operational P&P-ASVAB (Forms 10A, 10B, 11A, 11B, 13A, 13B)
  - CAT-ASVAB (Two Forms)
    - On-line Calibration Evaluation--Each Adaptive Test Contains One Non-Adaptive, Seeded Item
  - Reference Battery: P_1&P-ASVAB Form 8A
- Procedures: Testing on Same or Successive Days
  - Group 1--CAT-ASVAB Form 1, Then Operational P&P-ASVAB
  - Group 2--CAT-ASVAB Form 2, Then Operational P&P-ASVAB
  - Group 3--P&P-ASVAB Form 8A, Then Operational P&P-ASVAB

SCORE EQUATING DEVELOPMENT

Status

- Applicants Tested at MEPS/METS Complexes (as of 20 Nov 1988):

Location	Status	CAT	P&P	Total
San Diego	Completed (1 of 2)	411	207	618
Richmond	Completed	1306	639	1965
Seattle	Completed	841	429	1270
Boston	Completed	1219	649	1868
Omaha	Completed	611	303	914
Jackson	Completed	676	345	1021
San Diego	Ongoing (2 of 2)	230	138	368

- Applicant Flow Rates -- Lower than Expected
- Microcomputer Performance -- Satisfactory
- Logistics -- No Problems

Score Equating Verification

Description

- **Purpose: Evaluate Motivation Effect on Item Calibration and Equating**
- **Subjects: Military Service Applicants at Six MEPS/METS (N = 7500)**
- **Measures:**
  - **Operational CAT-ASVAB (Two Forms)**
  - **Operational P&P-ASVAB (Form 8A)**
- **Procedures:**
  - **Group 1--CAT-ASVAB Form 1**
  - **Group 2--CAT-ASVAB Form 2**
  - **Group 3--P&P-ASVAB Form 8A**
- **CAT-ASVAB Scores Based Upon Score Equating Study**
- **Equipercentile Equating for Subsequent Operational Use**

Score Equating Verification

Status

- **Planned Schedule:**

Location	Begin	End
San Diego	01 Feb 90	28 Feb 90
Richmond	01 Jun 90	31 Aug 90
Seattle	01 Aug 90	31 Oct 90
Boston	01 Oct 90	31 Dec 90
Omaha	03 Dec 90	28 Feb 91
Jackson	01 Feb 91	30 Apr 91

CAT - ASVAB Advantages

- Administrative
- Scoring
- Precision
- Security
- Motivation / Image
- Future Tests

CAT - ASVAB Advantages
Administrative

- Reduced Test Session Length
- Flexible Test Sessions
- Improved Standardization
- Simplified Revision

CAT - ASVAB Advantages
Scoring

- Automation reduces clerical error

- Results available more quickly

CAT - ASVAB Advantages
Precision

- Better at high & low ability levels

- Same at mid-range ability levels

CAT - ASVAB Advantages
Security

- No test booklets

- Items stored in volatile memory

CAT - ASVAB Advantages
Motivation / Image

- Examinees prefer CAT-ASVAB

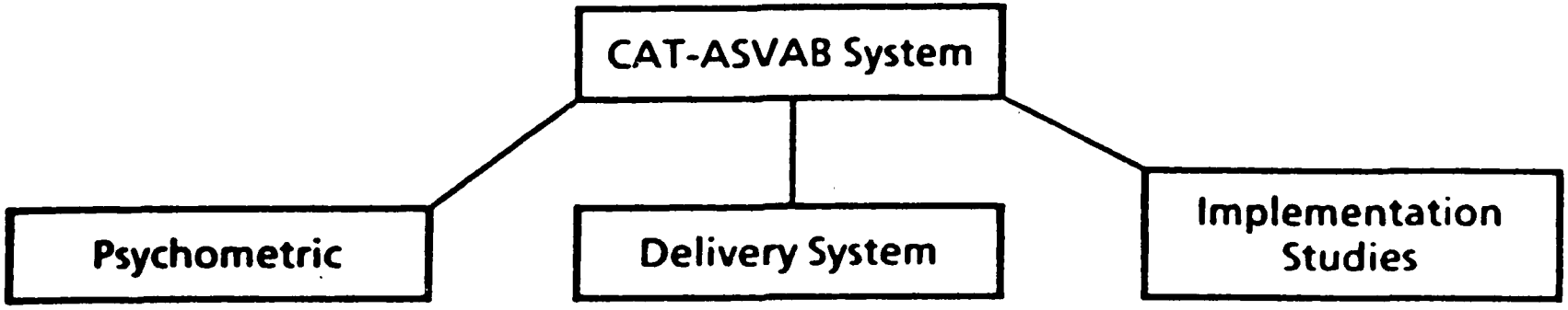
- Positive military image

CAT - ASVAB Advantages
Future Tests

- Dynamic test items

- Response latency measurement

CAT-ASVAB Ongoing Program



- Item Banks
- Reliability & Validity
- Equating
- Test Administration
- Technical Manual

- Accelerated Program
- Full-Scale Development

- Economic Analysis/ Concept of Operations
- Psychometric Maintenance
- Public Relations

ACCELERATED CAT-ASVAB PROGRAM PSYCHOMETRIC ACCOMPLISHMENTS

BRUCE BLOXOM
DEFENSE MANPOWER DATA CENTER

DEPARTMENT OF DEFENSE
MANPOWER DATA CENTER

REPLY TO DMDC
☐ 1600 N. WILSON BLVD. SUITE 400
ARLINGTON, VIRGINIA 22209-2593
☒ 550 CAMINO EL ESTERO, SUITE 200
MONTEREY, CALIFORNIA 93940-3231
☐ 2100 GARDEN ROAD, SUITE J
MONTEREY, CALIFORNIA 93940-5316

12 December 1988

MEMORANDUM FOR DR. EARL A. ALLUISI

SUBJECT: Minutes of Selection and Classification
Topical Area Review

ENCLOSURE: Briefing Slides, Technical Addendum and References

Enclosed are clean copies of the briefing slides and technical addendum, plus the references which you requested, for my presentation at the Selection and Classification Topical Area Review which was held on 8-9 December 1988 at IDA. They are for inclusion in the minutes of the Review.

Thank you for the opportunity to present the work of the CAT-ASVAB Technical Committee.

Bruce Bloxom

Bruce Bloxom
Personnel Security Data and
Special Studies Branch

Accelerated CAT-ASVAB Program
Psychometric Accomplishments

Dr. Bruce Bloxom

Chairman, Technical Committee

CAT-ASVAB Working Group

Briefing Presented To

Assistant for Training and Personnel Systems Technology
(ODDDR&E/R&AT)

and

Director for Accession Policy
(OASD/FM&P)

9 December 1983

Washington, DC

Overview of Briefing

Background

- General Purpose of ACAP Psychometric Studies
- Types of ACAP Psychometric Studies

Evaluation of Accomplishments of Studies

- Method of Evaluation
- Results of Evaluation
  - Summary of Research Bases
  - Summary of Output of Studies
  - Compilations of Studies
- Conclusions

Background

GENERAL PURPOSE OF
ACAP PSYCHOMETRIC STUDIES

Develop additional psychometric knowledge which is necessary for Full-Scale Development (FSD) of Computerized Adaptive Testing Version of the Armed Services Vocational Aptitude Battery (CAT-ASVAB)

Background

TYPES OF ACAP PSYCHOMETIC STUDIES

Procedures for Development of CAT-ASVAB Forms

Evaluate Influences on CAT-ASVAB Score Precision

Evaluate Equating of CAT-ASVAB and ASVAB

Evaluate Validity of CAT-ASVAB

Evaluation of Accomplishments

METHOD OF EVALUATION

1. Compile information provided to CAT-ASVAB Technical Committee
2. Classify studies reported or briefed since start of ACAP
3. Identify research basis of each study
4. Identify output of each study

Evaluation of Accomplishments

METHOD OF EVALUATION

Classification of Studies

Procedures for Development of Forms (25 Studies)

- Item Pools
- Adaptive Testing Procedures
- Speeded Test Procedures
- Pre-Test of CAT-ASVAB
- Equating CAT-ASVAB and ASVAB

Evaluate Influences on Score Precision (6 Studies)

- Influences on Item Calibration
- Comparison of CAT-ASVAB and ASVAB

Evaluate Equating of CAT-ASVAB and ASVAB (4 Studies)

- Equivalence of Results by Form, Subgroup and Condition

Evaluate Validity of CAT-ASVAB (3 Studies)

- Correlations Among Subtests
- Predictive Validity

Evaluation of Accomplishments

METHOD OF EVALUATION

Types of Output of Studies

Use in CAT-ASVAB for ACAP

Report or Publication

Briefing of Results

- CAT-ASVAB Technical Committee (CTC)
- Defense Advisory Committee (DAC)
- Conference Paper (CONF)

Collection of Data

Briefing of Analysis Plans

- CAT-ASVAB Technical Committee (CTC)
- Defense Advisory Committee (DAC)

Contract Deliverable

Evaluation of Accomplishments

RESULTS OF EVALUATION

Summary of Research Bases

Type of Study	Type of Research Basis		
	ONR Work Unit	Other Publication	Stand. Method
Procedures for Development of Forms			
Item Pools	5	0	4
Adaptive Testing	4	3	1
Speeded Testing	1	0	0
Pre-Test	2	0	0
Equating	3	1	1
Evaluate Precision	6	0	0
Evaluate Equating	0	0	4
Evaluate Validity	0	1	2
Total	21	5	12

Total Studies 38

Evaluation of Accomplishments

RESULTS OF EVALUATION

Summary of Output of Studies

Type of Study	Type of Output					
	Use in CAT	Report Results	Brief Collect Data	Brief Plans	Contract Deliver.	
Procedures for Development of CAT-ASVAB Forms						
- Item Pools	8	2	5	-	-	1
- Adaptive Testing	8	0	8	-	-	0
- Speeded Testing	1	0	1	-	-	0
- Pre-Test	1	1	2	-	-	1
- Equating	3	0	5	-	-	0
Evaluate Precision	-	1	2	3	2	0
Evaluate Equating	-	0	0	3	4	0
Evaluate Validity	-	0	2	0	1	2
Total	21	4	25	6	7	4

Total Studies 38

Evaluation of Accomplishments

RESULTS OF EVALUATION

Compilations of Studies

Activity	Document
Development of Forms of CAT-ASVAB for ACAP	Psychometric Decision List
Five Data Collections	
- Joint-Service Validity Study	Contract Deliverable
- Score Equating Development	Data Analysis Plan
- Cross-Correlational Check	Data Analysis Plan
- Medium of Administration	Data Analysis Plan
- Score Equating Verification	Data Analysis Plan

Evaluation of Accomplishments

CONCLUSIONS

1. ACAP psychometric studies are based on research studies and standard methods.

2. Studies of procedures for development of CAT-ASVAB will result in psychometrically sound CAT-ASVAB forms.

3. Joint-Service Validity Study and studies now in progress will address questions of psychometric feasibility of CAT-ASVAB as a substitute for ASVAB in the near term and in Full-Scale Development.

PSYCHOMETRIC ACCOMPLISHMENTS

OF ACCELERATED CAT-ASVAB PROGRAM (ACAP)

TECHNICAL ADDENDUM TO BRIEFING

PROCEDURES FOR DEVELOPMENT OF CAT-ASVAB FORMS

ITEM POOLS

INITIAL DEVELOPMENT

STUDY: DIMENSIONALITY OF ASVAB SUBTESTS
BASIS: FULL INFORMATION FACTOR ANALYSIS (NR 475-018)
OUTPUT: USE IN CAT-ASVAB

STUDY: PRESTWOOD, VALE, MASSEY AND WELSH ITEM POOL
BASIS: EXISTING ASVAB ITEM TYPES (STANDARD METHOD)
OUTPUT: USE IN CAT-ASVAB, REPORT (AFHRL TR-85-19)

STUDY: EXPERIMENTAL CAT-ASVAB ITEM POOLS
BASIS: EXISTING ASVAB ITEM TYPES (STANDARD METHOD)
OUTPUT: USE IN CAT-ASVAB, BRIEF CTC AND DAC

ITEM CALIBRATION

STUDY: PRESTWOOD, VALE, MASSEY AND WELSH CALIBRATION
BASIS: JOINT MAXIMUM LIKELIHOOD (ONR 67/18, LORD)
OUTPUT: USE IN CAT-ASVAB, REPORT (AFHRL TR-85-19)

STUDY: CALIBRATION OF EXPERIMENTAL CAT-ASVAB ITEM POOLS
BASIS: JOINT MAXIMUM LIKELIHOOD (ONR 67/18, LORD)
OUTPUT: USE IN CAT-ASVAB, BRIEF CTC AND DAC

ITEM REVIEW

STUDY: ETS REVIEWS OF CONTENT, QUALITY AND SENSITIVITY
BASIS: SUBJECTIVE JUDGEMENTS (STANDARD METHOD)
OUTPUT: CONTRACT DELIVERABLE

STUDY: NPRDC REVIEWS OF CONTENT, QUALITY AND SENSITIVITY
BASIS: ETS REVIEWS PLUS ITEM STATISTICS (STANDARD METHOD)
OUTPUT: USE IN CAT-ASVAB, BRIEF CTC AND DAC

ASSIGNMENT TO FORMS

STUDY: OPTIMIZE SIMILARITY OF POOL INFORMATION FUNCTIONS
BASIS: TEST INFORMATION (NR 042-249, BIRNBAUM)
OUTPUT: USE IN CAT-ASVAB, BRIEF CTC AND DAC

FINAL ITEM POOLS

STUDY: RETAIN ITEMS USED IN SIMULATED ADAPTIVE TESTING
BASIS: ADAPTIVE ABILITY TESTING (NR 150-431, WEISS)
OUTPUT: USE IN CAT-ASVAB, BRIEF CTC AND DAC

PROCEDURES FOR DEVELOPMENT OF CAT-ASVAB FORMS

ADAPTIVE TESTING PROCEDURES

ITEM SELECTION

SELECTION CRITERION
STUDY: METHOD FOR CHOOSING NEXT ITEM
BASIS: ITEM INFORMATION FUNCTION (SAMEJIMA, 1969)
OUTPUT: USE IN CAT-ASVAB, BRIEF CTC AND DAC

EXPOSURE CONTROL
STUDY: LIMIT ITEM EXPOSURE IN CAT-ASVAB
BASIS: ADAPTIVE ABILITY TESTING (NR 150-431, WEISS)
OUTPUT: USE IN CAT-ASVAB, BRIEF CTC AND DAC

CONTENT BALANCING
STUDY: ITEM POOL FACTOR ANALYSES
BASIS: FULL INFORMATION FACTOR ANALYSIS (NR 150-541)
OUTPUT: USE IN CAT-ASVAB, BRIEF CTC AND DAC

SUBTEST TIME LIMITS
STUDY: ESTIMATE TESTING TIME OF SLOW EXAMINEES
BASIS: FIT OF LOGNORMAL DISTRIBUTION (STANDARD METHOD)
OUTPUT: USE IN CAT-ASVAB, BRIEF CTC AND DAC

TEST SCORING

INTERIM SCORE
STUDY: METHOD OF SCORING BETWEEN ITEMS
BASIS: APPROXIMATION TO POSTERIOR MEAN (OWEN, 1976)
OUTPUT: USE IN CAT-ASVAB, BRIEF CTC AND DAC

FINAL SCORE
STUDY: METHOD OF SCORING AT END OF TEST
BASIS: POSTERIOR MODE (SAMEJIMA, 1969)
OUTPUT: USE IN CAT-ASVAB, BRIEF CTC AND DAC

PENALTY FOR INCOMPLETE TEST
STUDY: SCORE REDUCTION FOR VERY SLOW EXAMINEES
BASIS: ADAPTIVE ABILITY TESTING (NR 150-431)
OUTPUT: USE IN CAT-ASVAB, BRIEF CTC

COMBINING AI AND SI SUBTESTS
STUDY: ONE SCORE TO EQUATE WITH ASVAB AS SUBTEST
BASIS: TEST CHARACTERISTIC CURVE (NR 042-249, BIRNBAUM)
OUTPUT: USE IN CAT-ASVAB, BRIEF CTC

PROCEDURES FOR DEVELOPMENT OF CAT-ASVAB FORMS

SPEEDED TEST PROCEDURES

TEST SCORING
STUDY: METHOD OF SCORING FROM ITEM RESPONSE TIMES
BASIS: STUDIES OF SCORING METHODS (NR 4421-534, GREEN)
OUTPUT: USE IN CAT-ASVAB, BRIEF CTC AND DAC

PROCEDURES FOR DEVELOPMENT OF CAT-ASVAB FORMS

PRE-TEST OF CAT-ASVAB

SUBJECTIVE RESPONSES OF EXAMINEES

STUDY: EXPERIMENTAL CAT-ASVAB ADMINISTERED TO RECRUITS
BASIS: EFFECTS ON MOTIVATION (NR 150-382, WEISS)
OUTPUT: DELIVERABLE, BRIEF CTC AND DAC,
REPORT (CNA RM-86-151)

STUDY: ACAP CAT-ASVAB WITH RECRUITS & HIGH SCHOOL STUDENTS
BASIS: EFFECTS ON MOTIVATION (NR 150-382, WEISS)
OUTPUT: USE IN CAT-ASVAB, BRIEF CTC, DAC AND CONFERENCE

PROCEDURES FOR DEVELOPMENT OF CAT-ASVAB FORMS

EQUATING CAT-ASVAB AND P&P-ASVAB

DATA EDITING

DIFFERENCE SCORES
STUDY: SELECT UNMOTIVATED EXAMINEES
BASIS: CLASSICAL TEST THEORY (NR 151-201, LORD/NOVICK)
OUTPUT: BRIEF CTC

APPROPRIATENESS MEASUREMENT
STUDY: SELECT EXAMINEES WITH ABERRANT DATA
BASIS: INDIVIDUAL MODELLING (NR 154-445, LEVINE ET AL)
OUTPUT: BRIEF CTC

DISTRIBUTION SMOOTHING
STUDY: SMOOTHING CAT-ASVAB AND P&P-ASVAB DISTRIBUTIONS
BASIS: WORK AT NPRDC, PLUS KRONMAL AND TARTER (1968)
OUTPUT: USE IN CAT-ASVAB, BRIEF CTC

SUBTEST EQUATING
STUDY: EQUATING CAT-ASVAB AND ASVAB SUBTESTS
BASIS: EQUIPERCENTILE (NR 150-463, GREEN ET AL)
OUTPUT: USE IN CAT-ASVAB, BRIEF CTC AND DAC

COMPOSITE EQUATING
STUDY: EQUATING CAT-ASVAB AND ASVAB SUBTESTS
BASIS: IDENTITY, LINEAR AND EQUIPERCENTILE (STANDARD METHOD)
OUTPUT: USE IN CAT-ASVAB, BRIEF CTC

EVALUATE INFLUENCES ON SCORE PRECISION

EFFECT OF CALIBRATION MEDIUM OF ADMINISTRATION

STUDY: EFFECT OF PARAMETER SPECIFICATION ERRORS
BASIS: ROBUSTNESS OF ADAPTIVE TEST (NR 150-433, WEISS)
OUTPUT: BRIEF CTC AND DAC

STUDY: ANALYSIS OF EXPERIMENTAL CAT-ASVAB DATA
BASIS: ITEM RESPONSE THEORY (NR 151-201, LORD/NOVICK)
OUTPUT: BRIEF CTC AND DAC, REPORT (CNA RM-86-189)

STUDY: MEDIUM-OF-ADMINISTRATION STUDY AT NAVY RTC
BASIS: MAXIMUM LIKELIHOOD ESTIMATION (ONR 67/18, LORD)
OUTPUT: DATA COLLECTED, PLAN BRIEFED TO CTC AND DAC

EFFECT OF USING ADAPTIVE DATA FOR CALIBRATION

STUDY: PRECISION OF ONLINE CALIBRATION
BASIS: MARGINAL MAXIMUM LIKELIHOOD (NR 875-018, BOCK)
OUTPUT: DATA COLLECTED (SCORE EQUATING DEVELOPMENT)

EFFECT OF OPERATIONAL MOTIVATION ON CALIBRATION

STUDY: COMPARISON OF ACAP ON-LINE CALIBRATIONS
BASIS: MARGINAL MAXIMUM LIKELIHOOD (NR 875-018, BOCK)
OUTPUT: HALF OF DATA COLLECTED

EFFECT OF CAT VERSUS CONVENTIONAL TESTING

STUDY: ALTERNATE FORM RELIABILITY OF CAT- AND P&P-ASVAB
BASIS: TEST THEORY (NR 151-201, LORD AND NOVICK)
OUTPUT: DATA COLLECTED, PLAN BRIEFED TO CTC AND DAC

EVALUATE EQUATING OF CAT-ASVAB AND P&P-ASVAB

EQUIVALENCE OF RESULTS BY CAT-ASVAB FORM
- STUDY: COMPARE EQUATING RESULTS OF TWO CAT-ASVAB FORMS
- BASIS: EQUIPERCENTILE EQUATING (STANDARD METHOD)
- OUTPUT: DATA COLLECTED, PLAN BRIEFED TO CTC AND DAC

EQUIVALENCE OF RESULTS BY SUBGROUP
- STUDY: COMPARE RESULTS FOR WOMEN AND FOR BLACKS
- BASIS: EQUIPERCENTILE EQUATING (STANDARD METHOD)
- OUTPUT: DATA COLLECTED, PLAN BRIEFED TO CTC AND DAC

EQUIVALENCE OF RESULTS BY MOTIVATIONAL CONDITION
- STUDY: COMPARE OPERATIONAL AND NON-OPERATIONAL RESULTS
- BASIS: EQUIPERCENTILE EQUATING (STANDARD METHOD)
- OUTPUT: HALF OF DATA COLLECTED, PLAN BRIEFED TO CTC AND DAC

EQUIVALENCE OF RESULTS BY ASVAB TESTING EXPERIENCE
- STUDY: COMPARE RESULTS FOR RETESTS AND INITIAL TESTS
- BASIS: EQUIPERCENTILE EQUATING (STANDARD METHOD)
- OUTPUT: DATA COLLECTED, PLAN BRIEFED TO CTC

EVALUATE VALIDITY OF CAT-ASVAB

CONVERGENT AND DISCRIMINANT VALIDITY

STUDY: CAT-ASVAB AND ASVAB SUBTEST CORRELATIONS
BASIS: FACTOR ANALYSIS (STANDARD METHOD)
OUTPUT: DELIVERABLE, BRIEF CTC, DAC AND CONFERENCE

STUDY: CAT-ASVAB AND P&P-ASVAB COVARIANCE STRUCTURES
BASIS: STRUCTURAL EQUATION MODELLING (JORESKOG, 1973)
OUTPUT: PLAN BRIEFED TO CTC AND DAC

PREDICTIVE VALIDITY

STUDY: CAT-ASVAB AND P&P-ASVAB PREDICTION OF TRAINING
BASIS: MULTIPLE LINEAR REGRESSION (STANDARD METHOD)
OUTPUT: DELIVERABLE, BRIEF CTC, DAC AND CONFERENCE

REFERENCES

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ENLISTED PERSONNEL SELECTION AND CLASSIFICATION

JOHN J. PASS
NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER

TOPICAL AREA REVIEW

Enlisted Personnel Selection and Classification

9 December 1988

BRIEFER: DR. JOHN J. PASS
PERSONNEL SYSTEMS DEPARTMENT
NAVY PERSONNEL RESEARCH &
DEVELOPMENT CENTER

FUTURE TESTS

THE PROJECT TO BE DESCRIBED IS FUTURE TESTS. IT IS CURRENTLY FUNDED WITH 6.2, EXPLORATORY DEVELOPMENT, AND O&M FUNDS. THE O&M FUNDS AUGMENT THE RESEARCH THAT IS BEING CONDUCTED. THE O&M FUNDS ARE PROVIDED BY THE CAT-ASVAB PROGRAM.

FUTURE TESTS

205

PE 0602233N

O&M

OBJECTIVE

THE OBJECTIVE OF THE RESEARCH IS SHOWN ON THIS VUGRAPH.

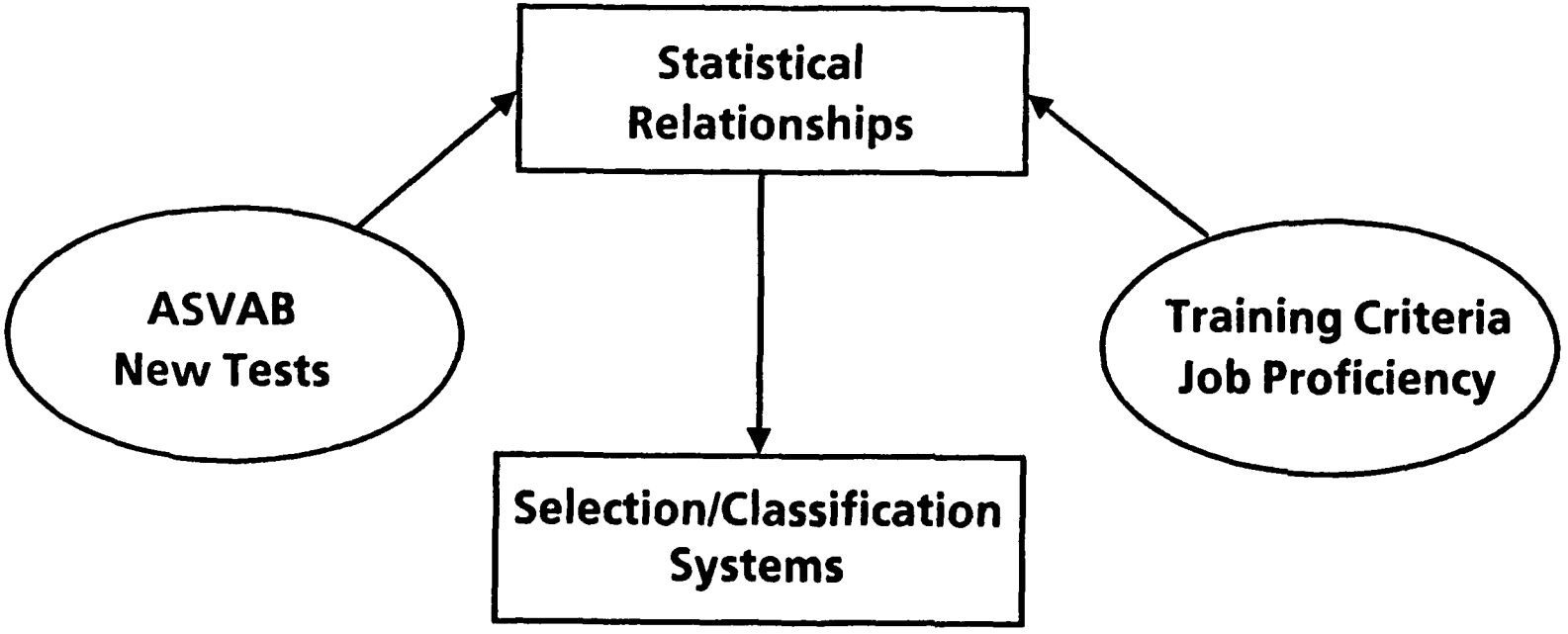
OBJECTIVE

IMPROVE MILITARY PERFORMANCE BY IMPROVING THE SELECTION AND CLASSIFICATION OF ENLISTED PERSONNEL

NEW MILITARY SELECTION AND CLASSIFICATION SYSTEM

TO DATE, THE SELECTION AND CLASSIFICATION TESTS THAT ARE IN PLACE ARE THOSE SUBTESTS OF THE ARMED SERVICES VOCATIONAL APTITUDE BATTERY (ASVAB). THIS BATTERY HAS BEEN VALIDATED ONLY ON TRAINING CRITERIA, AND THE THREE MAIN DIMENSIONS MEASURED BY ASVAB ARE THE KNOWLEDGE-BASED DIMENSIONS OF MATHEMATICS, VERBAL ABILITY, AND TECHNICAL INFORMATION. THIS PROJECT FOCUSES ON THE PREDICTOR SIDE, THAT IS, DEVELOPING NEW MEASURES OF COGNITIVE ABILITIES THAT ARE KNOWLEDGE-FREE.

NEW MILITARY SELECTION & CLASSIFICATION SYSTEM



UTILITY ANALYSIS

HISTORICALLY, THE WORK IN THIS AREA HAD BEEN PROCEEDING IN DIFFERENT PARTS OF OUR ORGANIZATION, BUT ABOUT THREE YEARS AGO, IT WAS CONSOLIDATED INTO ONE PROJECT. THIS CONSOLIDATION OF RESOURCES AND THE GROWING CONCERN FOR COST-BENEFIT ANALYSIS LED US TO HIRE DR. FRANK SCHMIDT AND DR. JOHN HUNTER TO CONDUCT A UTILITY ANALYSIS TO DETERMINE WHAT THE POTENTIAL WAS FOR DEVELOPING NEW TESTS TO AUGMENT THE CURRENT SELECTION AND CLASSIFICATION SYSTEM AND WHAT THE DOLLAR PAYOFF MIGHT BE. THE BASICS OF THE STUDY CONDUCTED ARE SHOWN ON THIS VUGRAPH. I MIGHT ADD THAT THE MEASURES THAT WERE EVALUATED WERE NOT THE NEW COMPUTERIZED TYPES OF MEASURES THAT ARE BEING DEVELOPED NOW. THERE IS THE POSSIBILITY THAT THE COMPUTERIZED MEASURES WILL MEASURE ABILITY DOMAINS OR ASPECTS OF DOMAINS HERETOFOR UNMEASURED. ONE OTHER POINT ABOUT THE STUDY, IT ONLY COVERS NAVY JOBS. THE BOTTOM LINE IS THAT SMALL INCREASES IN VALIDITY CAN HAVE A SUBSTANTIAL PAYOFF.

UTILITY ANALYSIS

ESTIMATES: THE DOLLAR INCREASE IN PERFORMANCE BY INCREASING THE PREDICTIVE CAPABILITY OF A SELECTION/CLASSIFICATION SYSTEM.

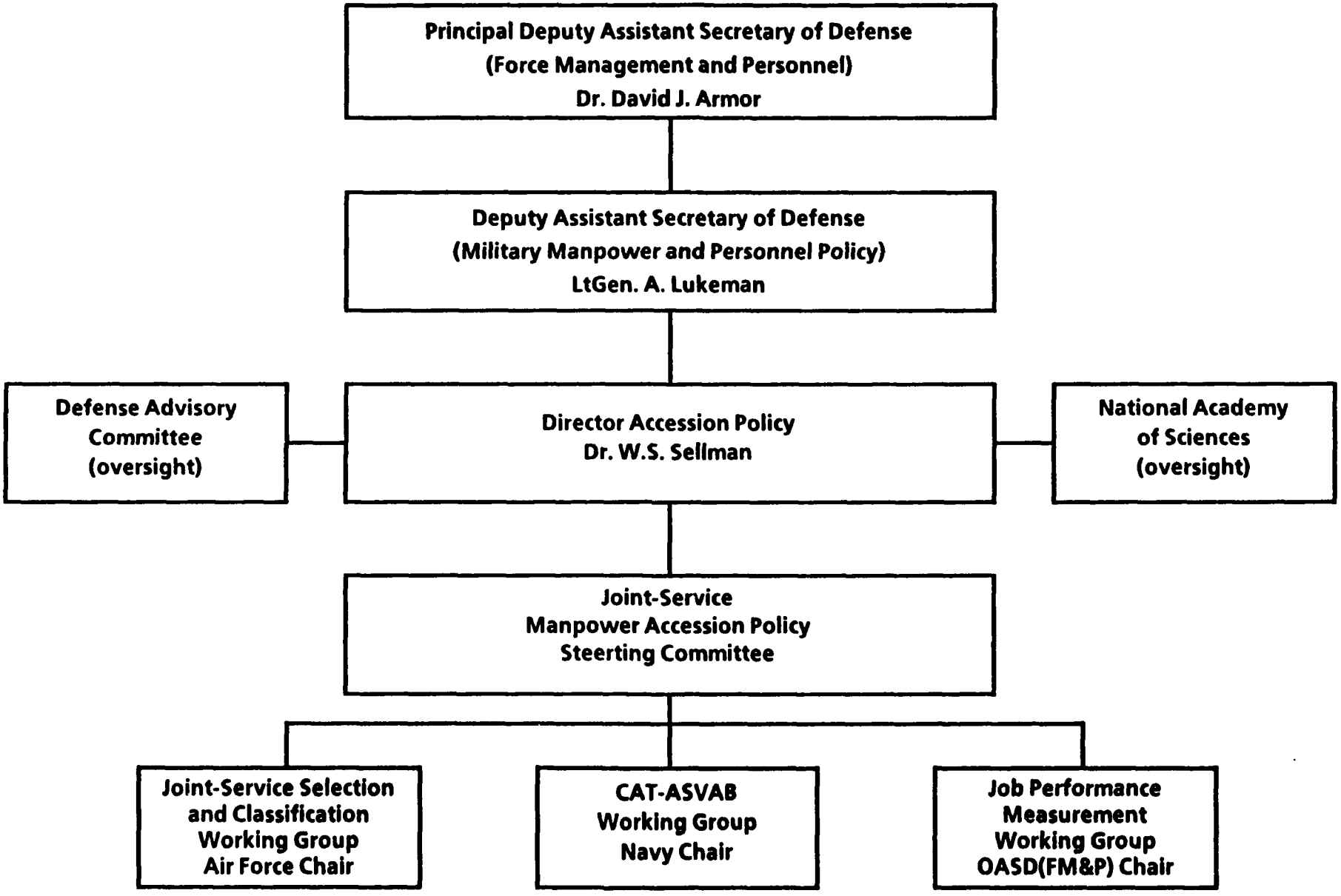
CONCEPT: IMPROVING THE MATCH BETWEEN ABILITY LEVEL AND COMPLEXITY OF JOB WILL IMPROVE PERFORMANCE.

APPROACH: EVALUATE BENEFIT OF ADDING MEASURES TO ASVAB.

ESTIMATED PAYOFF: AN INCREASE IN ASVAB VALIDITY OF 3% RESULTS IN AN 83 MILLION DOLLAR PERFORMANCE IMPROVEMENT

OVERSIGHT ORGANIZATION

THE SPONSOR FOR THE 6.2 FUNDS IS THE OFFICE OF THE CHIEF OF NAVAL RESEARCH (OCNR), AND WE DO HAVE A FORMAL REVIEW PROCESS. RECENTLY DR. STAN COLLYER OF OCNR HAS ATTEMPTED TO LINK THE 6.2 AND THE 6.3 WORLDS BY REQUESTING A PRIORITIZATION OF R&D THRUSTS BY THE 6.3 R&D STEERING COMMITTEE. IN ADDITION, WE HAVE OBTAINED O&M FUNDS AS PART OF THE CAT-ASVAB PROJECT AND, CONSEQUENTLY, WE ARE ALSO SUBJECT TO THE OVERSIGHT ORGANIZATION SHOWN ON THIS VUGRAPH.


Principal Deputy Assistant Secretary of Defense
(Force Management and Personnel)
Dr. David J. Armor
Deputy Assistant Secretary of Defense
(Military Manpower and Personnel Policy)
LtGen. A. Lukeman
Defense Advisory
Committee
(oversight)
Director Accession Policy
Dr. W.S. Sellman
National Academy
of Sciences
(oversight)
Joint-Service
Manpower Accession Policy
Steerting Committee
Joint-Service Selection
and Classification
Working Group
Air Force Chair
CAT-ASVAB
Working Group
Navy Chair
Job Performance
Measurement
Working Group
OASD(FM&P) Chair

APPROACH

AS STATED, THE ASVAB CONSISTS OF KNOWLEDGE-BASED TESTS AND OUR APPROACH IS TO SUPPLEMENT THE ASVAB WITH KNOWLEDGE-FREE TESTS OF APTITUDE.

APPROACH

TO SUPPLEMENT THE KNOWLEDGE-BASED TESTS OF THE ASVAB WITH "KNOWLEDGE-FREE" TESTS OF APTITUDE

TOWARD A MULTI-DIMENSIONAL ASVAB...

THIS TELLS YOU MORE ABOUT OUR APPROACH. WE'RE TRYING TO MOVE TOWARD A MULTI-DIMENSIONAL ASVAB. ACTUALLY, IT WILL BE THE CAT-ASVAB SYSTEM THAT WE'RE EXPANDING. WHEN WE LOOK AT WHAT THE ASVAB CURRENTLY MEASURES (ON THE LEFT), WE FIND THAT IT'S PRIMARILY AN INDEX OF KNOWLEDGE. WE CAN MAKE A DISTINCTION BETWEEN THE THREE KINDS OF KNOWLEDGE SHOWN, BUT THESE TESTS ARE HIGHLY INTERCORRELATED AND SEEM TO DRAW ON A GENERAL POOL OF ACADEMIC INFORMATION.

WHAT WE'RE PROPOSING (ON THE RIGHT) IS TO MAKE THE ASVAB MORE DIVERSE BY INCLUDING VARIOUS KNOWLEDGE-FREE SORTS OF TESTS. GOING BEYOND THE TESTS TO THE UNDERLYING ABILITIES, WE'RE LOOKING AT BASIC, PERFORMANCE-ORIENTED TYPES OF SKILLS TO SET UP A COUNTER-POINT TO THE CURRENT TESTS. THESE NEW TYPES OF TESTS MIGHT ALSO HAVE THE ADVANTAGE OF BEING LESS SENSITIVE TO CULTURAL FACTORS.

TOWARD A MULTI-DIMENSIONAL ASVAB....

CURRENT	PROPOSED
KNOWLEDGE-BASED	KNOWLEDGE-FREE
ASVAB VERBAL	COGNITIVE SPEED
ASVAB MATH	WORKING MEMORY
ASVAB TECHNICAL	SPATIAL ABILITIES
	REASONING ABILITY

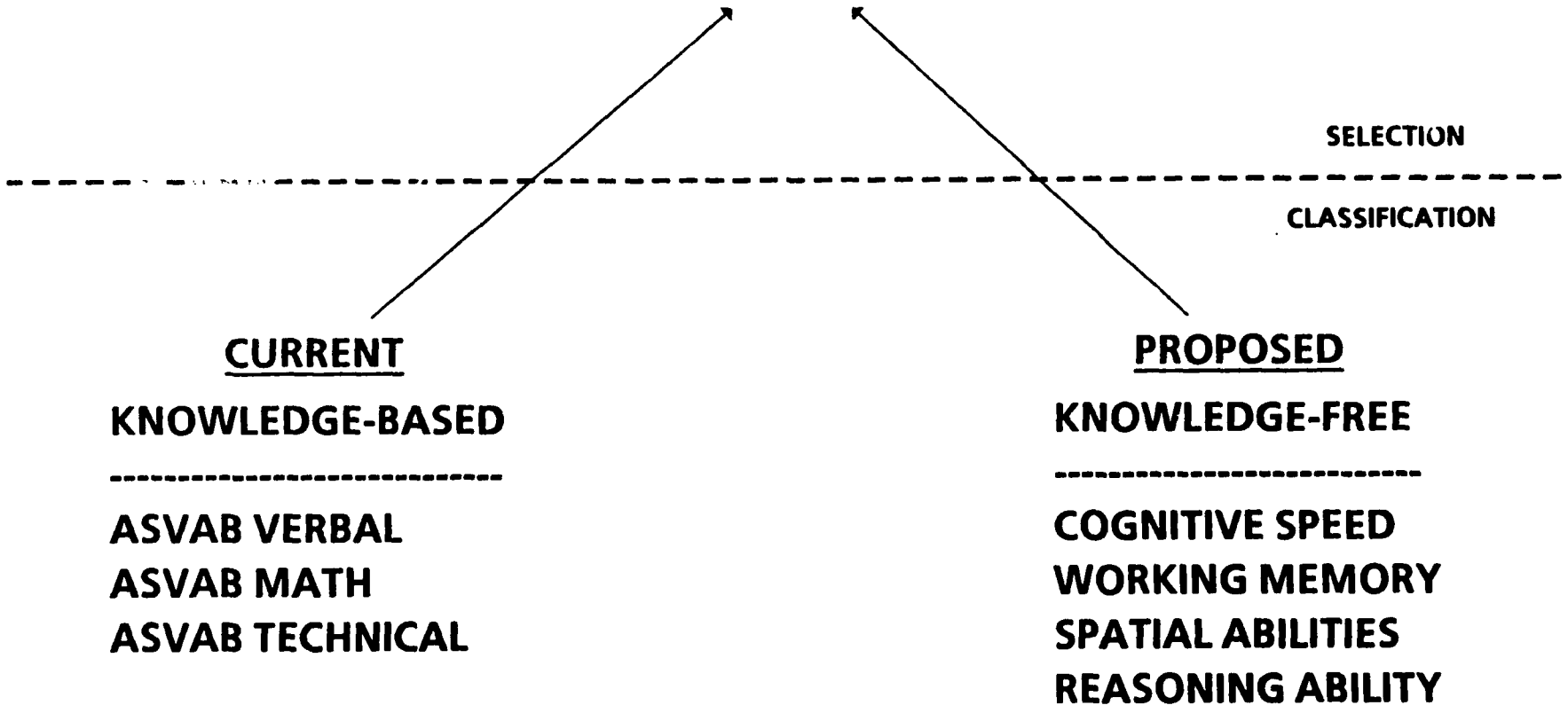
GENERAL ABILITY
(g)

THE NEXT SLIDE SHOWS HOW BROADENING THE ASVAB CAN IMPROVE PERSONNEL MEASUREMENT. LET'S LOOK AT SELECTION AND CLASSIFICATION. THE TOP LINE IS A SEPARATOR.

A. PERSONNEL SELECTION IS USUALLY BASED ON GENERAL MENTAL ABILITY, OR g, AND GENERAL ABILITY, IN TURN, IS ONE OF THE BEST PREDICTORS OF ANY PERFORMANCE CRITERIA. BOTH THEORETICALLY AND EMPIRICALLY, THE BEST ESTIMATES OF g COME FROM COMBINING DIVERSE SETS OF MEASURES, UNLIKE OUR CURRENT ARMED FORCES QUALIFICATIONS TEST (AFQT), WHICH IS RELATIVELY NARROWLY BASED. THE CURRENT AND PROPOSED TESTS, IN COMBINATION, WOULD YIELD A BROADLY BASED SELECTION COMPOSITE, OR THE AFQT OF THE FUTURE.

B. CLASSIFICATION. AGAIN, WE NEED A MULTI-DIMENSIONAL APPROACH, BECAUSE WE'RE TRYING TO MATCH A PATTERN OF INDIVIDUAL STRENGTHS AND WEAKNESSES WITH A PATTERN OF JOB REQUIREMENTS. THAT REQUIRES MULTIPLE POINTS OF INFORMATION, FOR WHICH WE NEED THESE DISSIMILAR TYPES OF TESTS

IN SUMMARY, WE EXPECT BETTER SELECTION AND CLASSIFICATION DECISIONS TO RESULT FROM USING A BROADER SET OF TESTS.


GENERAL ABILITY
(g)
SELECTION
CLASSIFICATION
CURRENT
KNOWLEDGE-BASED
ASVAB VERBAL
ASVAB MATH
ASVAB TECHNICAL
PROPOSED
KNOWLEDGE-FREE
COGNITIVE SPEED
WORKING MEMORY
SPATIAL ABILITIES
REASONING ABILITY

COGNITIVE SPEED/WORKING MEMORY:

IN OUR WORK ON COGNITIVE SPEED AND WORKING MEMORY, WE'VE ASKED "IS INTELLIGENCE RELATED TO THE EFFICIENCY WITH WHICH INDIVIDUALS MANIPULATE INFORMATION IN MEMORY?" THIS PROJECT WAS STARTED WITH 6.1 FUNDING. THE GOAL THROUGHOUT HAS BEEN TO DEVELOP A KNOWLEDGE-FREE TEST OF GENERAL INTELLIGENCE THAT CAN BE USED IN THE SELECTION COMPOSITE. THE PRODUCT OF THIS WORK IS THE MENTAL COUNTERS TEST, WHICH WAS DEVELOPED IN THE 6.2 STAGE AND IS PART OF OUR PROPOSED 6.3 WORK. BASICALLY, IT PRESENTS THE EXAMINEE WITH A RAPID FLOW OF INFORMATION ACROSS A SERIES OF VIDEO FRAMES, AND THE PROCESS OF KEEPING TRACK OF THAT INFORMATION TAXES THE INDIVIDUALS' SHORT-TERM MEMORY CAPACITY. THE TEST IS NONVERBAL, COMPLEX, AND EASY TO SCORE.

WE ARE WORKING CLOSELY WITH DR. PAT KYLLONEN, AFHRL, AND HIS CONTRACTOR, DR. RAY CHRISTAL, IN THIS AREA. WE BELIEVE WE ARE MAKING SOME SCIENTIFIC PROGRESS IN DESCRIBING A THEORETICAL BASIS FOR REASONING. THIS IS WORK WE WILL CONTINUE TO PURSUE WITH 6.2 FUNDS.

COGNITIVE SPEED/WORKING MEMORY:

"IS INTELLIGENCE RELATED TO THE EFFICIENCY WITH WHICH INDIVIDUALS MANIPULATE INFORMATION IN MEMORY?"

PRODUCT

6.2/O&M

6.1 -> MENTAL COUNTERS TEST -> 6.3

12 STUDIES, 1,400 SUBJECTS

ISSUES STUDIED

VERBAL VS. NONVERBAL TESTS
PERCEPTUAL CONFOUNDS
SEX BIAS
ACAP KEYBOARD
TASK COMPLEXITY
SPEED/ACCURACY TRADEOFFS

RELIABILITY
PREDICTIVE VALIDITY
CONSTRUCT VALIDITY
PRACTICE EFFECTS
MOTIVATION
RELATION TO ASVAB TESTS

SPATIAL ABILITIES:

OUR SECOND MAJOR PRODUCT IS A SPATIAL TEST. SPATIAL ABILITIES HAVE BEEN STUDIED FOR NEARLY 90 YEARS, AND THERE'S ABUNDANT EVIDENCE THAT SPATIAL APTITUDE IS IMPORTANT FOR SCHOOL AND JOB PERFORMANCE IN MANY AREAS, INCLUDING MECHANICAL ENGINEERING TYPES OF JOBS. IN THE AREA OF SPATIAL ABILITY, OUR MAJOR PRODUCT IS THE INTEGATING DETAILS TEST, WHICH ALSO IS PLANNED TO TRANSITION TO 6.3 WORK.

AGAIN, A NUMBER OF RESEARCH ISSUES WERE ADDRESSED IN DEVELOPING THIS TEST, INCLUDING ITEM DIFFICULTY AND THE BEST SCORING METHOD.

INTEGRATING DETAILS IS A POWER ORIENTED, COMPLEX SPATIAL TEST THAT HAS TO BE SOLVED IN STEPS. THE DIMENSION BEING MEASURED IS COMPLEX SPATIAL VISUALIZATION.

SPATIAL ABILITIES:

PRODUCT

6.2/O&M

INTEGRATING DETAILS -> 6.3

11 STUDIES, 2,600 SUBJECTS

ISSUES STUDIED

TEST COMPLEXITY
SEX BIAS
SPEED/ACCURACY TRADEOFFS
PRACTICE EFFECTS
RELIABILITY

PREDICTIVE VALIDITY
CONSTRUCT VALIDITY
RELATION TO ASVAB TESTS
ITEM ANALYSIS

INTEGRATING DETAILS

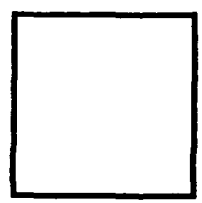
ONE CRITICAL ASPECT OF THE TEST IS THAT THE EXAMINEE MUST GENERATE AND MAINTAIN HIS OWN MENTAL IMAGE OF THE PROBLEM -- THIS IS IMPORTANT TO VALIDITY AND IS ONLY PRACTICAL WITH A COMPUTER-ADMINISTERED VERSION OF THE TEST. THE TEST HAS SHOWN CONSIDERABLE PROMISE IN PROVIDING INCREMENTAL VALIDITY OVER THE ASVAB FOR A STUDY SAMPLE OF MACHINISTS MATES. THE MULTIPLE R INCREASED BY 16% OR BY .07 (FROM .44 TO .51). IT SHOULD ALSO BE NOTED THAT THIS TEST CORRELATES ABOUT .50 WITH THE ARMY SPATIAL TESTS.

INTEGRATING DETAILS

Imagine connecting the matching letters to
form a completed puzzle. Remember this object.

<< PRESS THE ENTER KEY TO CONTINUE >>

If this object matches the one you
just formed and remembered, then;



Press A[same] or E[different]

ACCOMPLISHMENTS

OUR ACCOMPLISHMENTS ARE LISTED ON THIS VUGRAPH. (THE TEST-RETEST FOR INTEGRATING DETAILS IS .74)

ACCOMPLISHMENTS

COGNITIVE SPEED/WORKING MEMORY

- TEST-RETEST RELIABILITIES OF COGNITIVE SPEED TESTS
- VALIDATION OF COGNITIVE SPEED TESTS AGAINST ET SCHOOL PERFORMANCE
- FURTHER DEVELOPMENT OF "MACHINE-PACED" TEST CONCEPT
- INTRODUCTION OF MENTAL COUNTERS INTO JPM STUDIES (RM, ET)
- TWO STUDIES OF MOTIVATION CONDUCTED

SPATIAL TESTS

- NEW VERSION OF INTEGRATING DETAILS: JPM VALIDATION ON ETs
- TEST-RETEST RELIABILITY FOR INTEGRATING DETAILS
- COMPARISON OF HP AND APPLE VERSIONS OF INTEGRATING DETAILS

OTHER

- PSYCHOMOTOR ABILITIES REVIEWED
- PRELIMINARY VALIDATION OF NEW REASONING TESTS
- FUTURE TEST/ACAP WORKING COMMITTEE ESTABLISHED

PLANS

THIS VUGRAPH LISTS OUR ADVANCED DEVELOPMENT PLANS DESIGNED TO ASSESS THE FEASIBILITY OF USING MENTAL COUNTERS AND INTEGRATING DETAILS OPERATIONALLY AT THE MEPS. SINCE THE TASKING HAS NOT BEEN ASSIGNED, NO PLANS HAVE BEEN INCLUDED FOR THE VALIDATION OF THE DOD APPROVED BATTERY THROUGHOUT THE SERVICES.

PLANS

ADVANCED DEVELOPMENT PLANS

- JPM VALIDATION OF MENTAL COUNTERS AND INTEGRATING DETAILS
- RTC VALIDATION OF MENTAL COUNTERS, INTEGRATING DETAILS, ASAP, AND ACAP FOR SELECTED RATINGS (CONTINGENT ON FUNDING)[a]
- FOR NEW TESTS, DETERMINE
  - PRACTICE/COACHING EFFECTS
  - GENDER/RACE EFFECTS
- INTEGRATE NEW TESTS WITH CAT-ASVAB (INCLUDING NORMS, CUT-OFFS, IOT&E)

[a]DOES NOT INCLUDE DOD-WIDE VALIDATION PROGRAM

PLANS

THIS VUGRAPH LISTS OUR EXPLORATORY DEVELOPMENT PLANS. THESE ARE INTENDED TO PRODUCE NEW SELECTION AND CLASSIFICATION PRODUCTS THAT CAN BE USED TO UPGRADE THE NAVY AND DOD SYSTEMS IN THE TWENTY-FIRST CENTURY.

PLANS

EXPLORATORY DEVELOPMENT PLANS

- NEW WORKING MEMORY TESTS
  - PRACTICE/COACHING EFFECTS
  - VALIDATION
  - RELIABILITY
- NEW PROCESS MEASURES OF REASONING
  - VALIDATION
  - RELIABILITY
- RELATIONSHIPS AMONG ASVAB, MEMORY, AND REASONING
- COMPONENTS OF GENERAL ABILITY
  - STRATEGY-BASED
  - OVERLAPPING PROCESSES
  - WORKING MEMORY OR ATTENTIONAL SOURCE

FUNDING

THIS IS THE FUNDING THAT WILL BE REQUIRED TO SUPPORT OUR EXPLORATORY AND ADVANCED DEVELOPMENT PLANS THROUGH FY93. THE SHORT-FALL IN AVAILABLE RESEARCH AND DEVELOPMENT DOLLARS WILL NEED TO BE FILLED FROM O&M OR OTHER SOURCES. THE FUNDING SHOWN HERE DOES NOT REFLECT THE COST OF VALIDATING A DOD APPROVED BATTERY OF TESTS EITHER IN THE NAVY OR ACROSS THE ARMED SERVICES.

FUNDING
($K)

PROGRAMMED

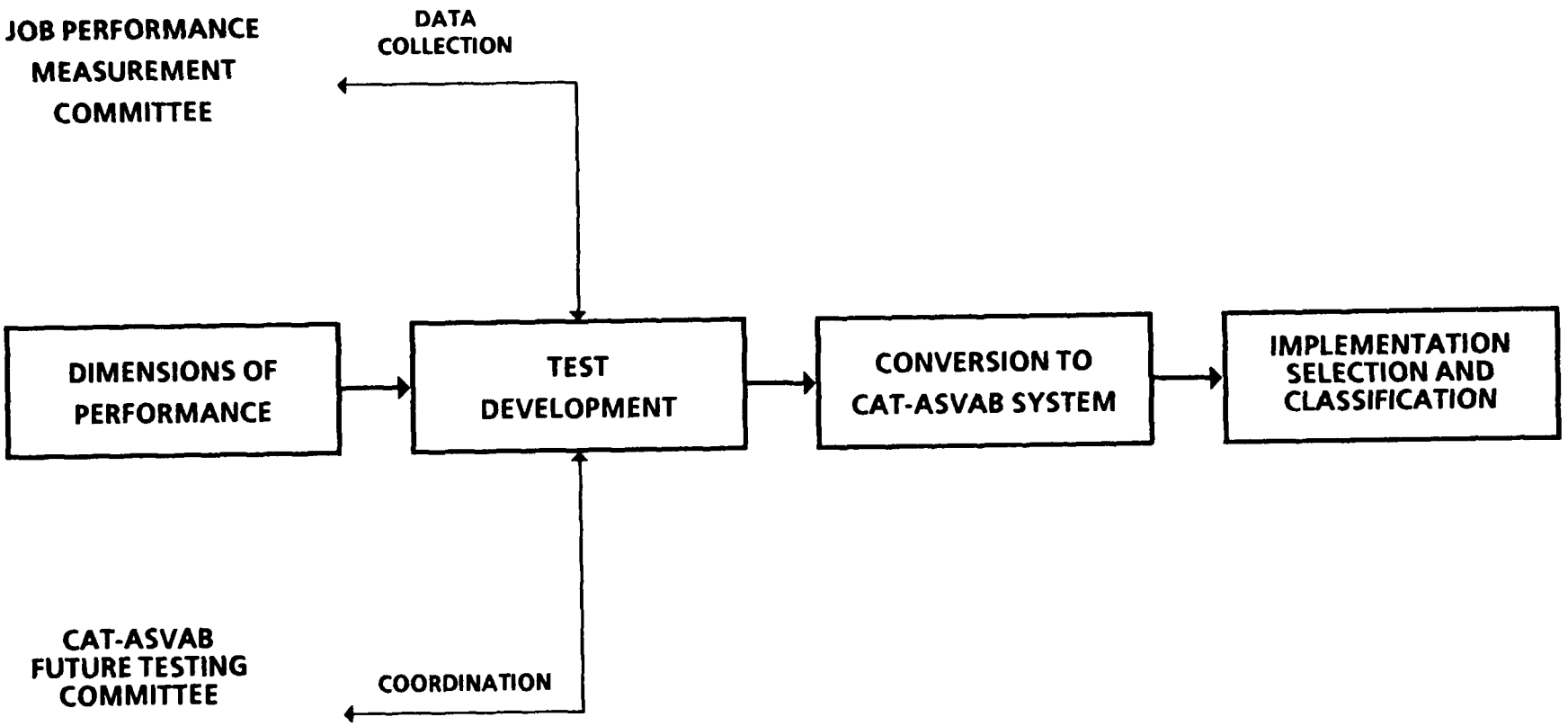
	FY89	FY90	FY91	FY92	FY93
6.2	225	260	422	452	484
6.3	-----	112	154	159	238
O&M	450	-----	-----	-----	-----
	675	372	576	611	722
REQUIREMENT[a]	727	795	735	835	835
DEFICIT	52	423	159	224	113

[a]OMITS COST OF VALIDATING DOD BATTERY

FUTURE TESTS - DEVELOPMENT FLOW

THE OVERALL DEVELOPMENTAL FLOW AND POINTS OF INTER-SERVICE COORDINATION ARE DISPLAYED.

FUTURE TESTS - DEVELOPMENT FLOW



REDIRECTION OF COMPUTERIZED ADAPTIVE TESTING

CLESSEN J. MARTIN
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
(OP-136)

REDIRECTION OF COMPUTERIZED ADAPTIVE TESTING BRIEFING FOR TOPICAL AREA REVIEW

9 DECEMBER 1988

DR. CLESSEN J. MARTIN
DEPARTMENT OF THE NAVY

BRIEFING OBJECTIVES

PRESENT PROGRAM OBJECTIVES AND MILESTONES FOR:

- ACCELERATED CAT-ASVAB PROJECT (ACAP)
- ENHANCED COMPUTERIZED ADAPTIVE TESTING (ECAT)

MAJOR PROGRAM MILESTONES

ACAP

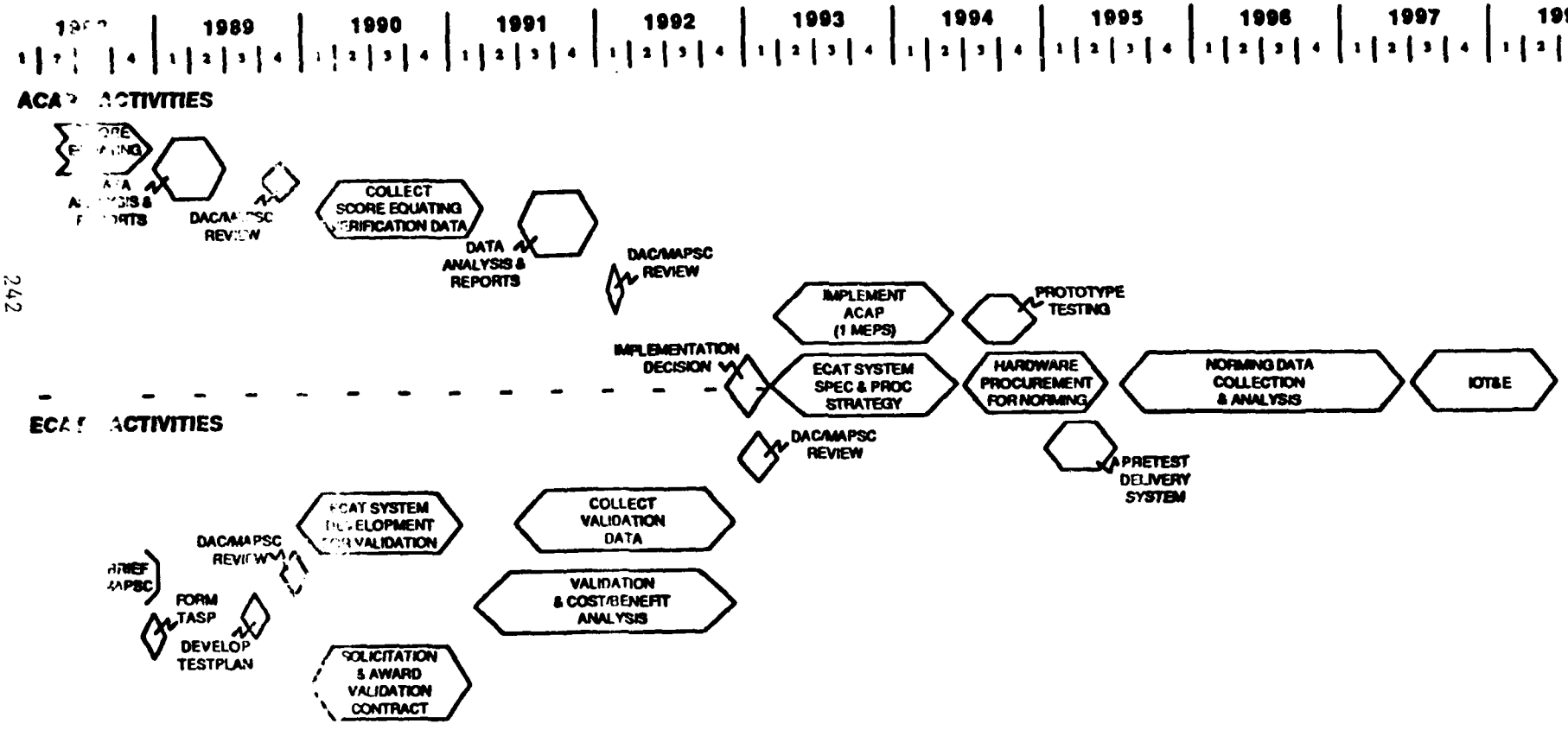
- EQUATE COMPUTERIZED ADAPTIVE ASVAB TO PAPER AND PENCIL ASVAB
- VERIFY CAT-ASVAB EQUATING AT SIX MEPS AND ASSOCIATED METS
- POSSIBLE IMPLEMENTATION IN ONE MEPS

ECAT

- CREATE COMPUTERIZED TEST BATTERY BASED ON SERVICES' NEW COGNITIVE TESTS
- VALIDATE NEW COMPUTERIZED TEST BATTERY IN SERVICES' RECRUIT TRAINING CENTERS
- EXAMINE UTILITY GAINS OF NEW TESTS

PARALLEL DEVELOPMENT OF ACAP AND ECAT

(October 18, 1988)



ACTION REQUIREMENTS FOR EACH SERVICE

- APPOINT REPRESENTATIVE TO TECHNICAL ADVISORY SELECTION PANEL (TASP)
- SUBMIT A MAXIMUM OF FOUR NEW TESTS AND SUPPORTING DATA TO TASP
- IDENTIFY SIX TO TEN MILITARY JOBS FOR TEST VALIDATION
- ASSIST IN COORDINATION OF VALIDATION DATA COLLECTION AT RECRUIT TRAINING CENTERS

COMPUTERIZED TESTING PROGRAMS

BUDGET PROFILE

AGENCY	FY - 88	FY - 89	FY - 90	FY - 91	FY - 92	FY - 93	FY - 94	TOTAL
OP - 91 (NAVY)	572,000	537,000	537,000	537,000	537,000	537,000	537,000	3,794,000
NMPC O & MN (NAVY)	2,709,000	2,985,000	2,882,000	3,015,000	3,099,000	3,170,000	3,243,000	21,103,000
R & D (NAVY)	678,000	700,000	700,000	700,000	700,000	0	0	3,478,000
USMC	750,000	750,000	650,000	0	0	0	0	2,150,000
ARMY / USMEPCOM	1,150,000	0	0	TBD	TBD	TBD	TBD	1,150,000
FY TOTALS	5,859,000	4,972,000	4,769,000	4,252,000	4,336,000	3,707,000	3,780,000	31,675,000

CAT-ASVAB PROGRAM
CONCEPT OF OPERATION AND COST
COST/BENEFIT ANALYSES

CLESSEN J. MARTIN
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
(OP-136)

CAT-ASVAB PROGRAM

CONCEPT OF OPERATION AND COST/BENEFIT ANALYSIS

Briefer:
Dr. Clessen Martin

CAT-ASVAB PROGRAM CONCEPT OF OPERATION AND COST/BENEFIT ANALYSIS

OVERVIEW

- CAT-ASVAB History & Rationale
- Background
- CAT-ASVAB Program Life Cycle
- Approach
- Alternatives
- Life Cycle Costs
- CAT-ASVAB Benefits
- Other Considerations
- Summary
- Recommendations

CAT-ASVAB PROGRAM CONCEPT OF OPERATION AND COST/BENEFIT ANALYSIS

HISTORY & RATIONALE

- **Multi-Year and Multi-Million Dollar R&D Program Designed to Computerize ASVAB**
  - **Joint Service Program Initiated 1979**
  - **Accelerated CAT-ASVAB Project (ACAP) began 1985**

- **Incorporates New Testing Technology and Off-the-Shelf Equipment**
  - **Tailored Item Administration**
  - **Relatively Low-Cost Personal Computers**

CAT-ASVAB PROGRAM CONCEPT OF OPERATION AND COST/BENEFIT ANALYSIS

HISTORY & RATIONALE (CONTINUED)

- Major Advantages of CAT-ASVAB System
  - — Automation of Test Administration and Scoring
  - — On-Line Calibration
  - — Reduction in Test Compromise
  - — Greater Precision for Low and High Ability Groups
  - — Potential Reduction in Administration Time
  - — Incorporation of New Kinds of Tests
    - -- Current Tests Do Not Measure Full Range of Abilities
    - -- Permits Measurement of Learning Rates and Reaction Times

CAT-ASVAB PROGRAM CONCEPT OF OPERATION AND COST/BENEFIT ANALYSIS

BACKGROUND

PURPOSE

- Present Results of Updated CAT-ASVAB Concept of Operation and Cost/Benefit Analyses

OBJECTIVE

- Quantify Major Impacts Resulting from CAT-ASVAB

CONSTRAINTS/ASSUMPTIONS

- No Change in Organizational Responsibilities
- 3 Concepts from 1987 EA Plus Mobile CAT-ASVAB
- Annual Production Testing Volume Will Not Change Significantly
- Focused on Enlistment Testing Program
- 10 Year CAT-ASVAB System Operational Life
- FY–87 Constant Dollars
- 1987 EA Baseline

CAT-ASVAB PROGRAM CONCEPT OF OPERATION AND COST/BENEFIT ANALYSIS

APPROACH

- Previous EA Used as Baseline for Costs
  - Development
  - Procurement
  - Implementation
  - Recurring (Operations & Support)
- Collect MEPS Input on Life Cycle Costs & Feasibility Issues
- Collect Updated Benefits Input
  - Better Person - Job Match (Dollar Value)
- Estimate Life-Cycle Costs/Benefits
- Identify and Characterize Operational Problems

CAT-ASVAB PROGRAM CONCEPT OF OPERATION AND COST/BENEFIT ANALYSIS

ALTERNATIVES

A Centralized CAT-ASVAB Testing
- MEPS Only — No OPM Enlistment Testing
- All Applicants Transported to MEPS

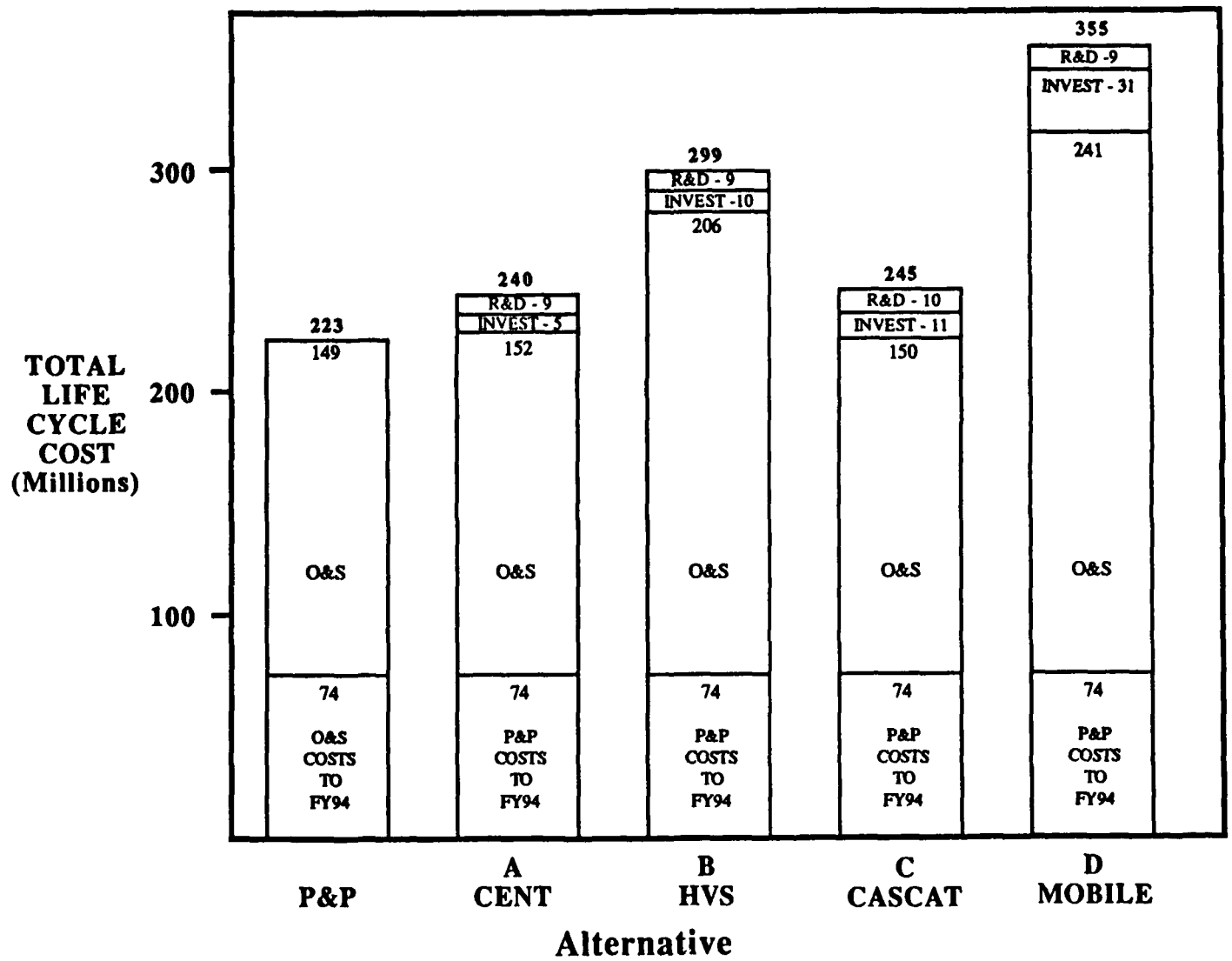
B High Volume Sites CAT-ASVAB Testing
- MEPS Plus 273 High Volume MET Sites
- OPM Support for High Volume Sites

C Computerized Adaptive Screening and CAT-ASVAB Testing
- MEPS Only — No OPM Enlistment Testing
- Recruiters Administer Computerized Screening Test

D Mobile CAT-ASVAB Testing
- MEPS, 50 HVS and Vehicles for CAT-ASVAB
- OPM Support for HVS
- MEPS Operate 283 Testing Vehicles

CAT-ASVAB PROGRAM CONCEPT OF OPERATION AND COST/BENEFIT ANALYSIS

LIFE CYCLE COST COMPARISON



CAT-ASVAB ECONOMIC BENEFITS ANALYSIS

UTILITY FORMULA

$$U = NTSDy(r_N - r_1)\ \overline{X} - (C_N - C_1)$$

WHERE:

U	=	TOTAL VALUE OF GAIN IN OUTPUT OF ACCESSED PERSONNEL FOR DURATION OF SERVICE
N	=	ENLISTED PERSONNEL ACCESSIONS (ACTIVE NONPRIOR SERVICE)
T	=	AVERAGE TENURE OF ENLISTED PERSONNEL
SDy	=	STANDARD DEVIATION OF PERFORMANCE IN DOLLARS
$(r_N - r_1)$	=	DIFFERENCE IN PREDICTIVE VALIDITY (CAT VS P&P ASVAB)
$\overline{X}$	=	AVERAGE STANDARD PREDICTOR SCORE OF ACCESSED PERSONNEL AT SPECIFIED SELECTION RATIO
$(C_N - C_1)$	=	DIFFERENCE IN LIFE CYCLE COSTS (CAT ALTERNATIVE VS P&P ASVAB)

CAT-ASVAB ECONOMIC BENEFITS ANLYSIS

DATA

- CAT-ASVAB LIFE CYCLE: FY 1987 THROUGH FY 2001 (ECONOMIC ANALYSIS)
- ANNUAL ENLISTED ACCESSIONS: 310,000 (OASD - FM&P)
- AVERAGE TENURE OF ENLISTEES: 6,04 YEARS (SEC DEF)
- PREDICTIVE VALIDITY INCREMENT, CAT VS P&P: 0.5% (NPRDC & DMDC)
- MEAN VALUE OF ENLISTEES OUTPUT: 23,308 PER YEAR (SEC DEF 1987 REPORT TO CONGRESS)
- SD OF PERFORMANCE: 20% OF MEAN OUPUT (HUNTER, SCHMIDT, MAY)
- SD OF PERFORMANCE IN DOLLARS: $4662 (CALCULATED)
- AVERAGE PREDICTOR SCORE FOR ACCESSED APPLICANTS (STANDARD SCORE FORM): 0.35 (HUNTER & HUNTER)
- LIFE CYCLE COST ESTIMATES FOR P&P ASVAB AND CAT-ASVAB ALTERNATIVES: DRAWN FROM CAT-ASVAB ECONOMIC ANALYSIS

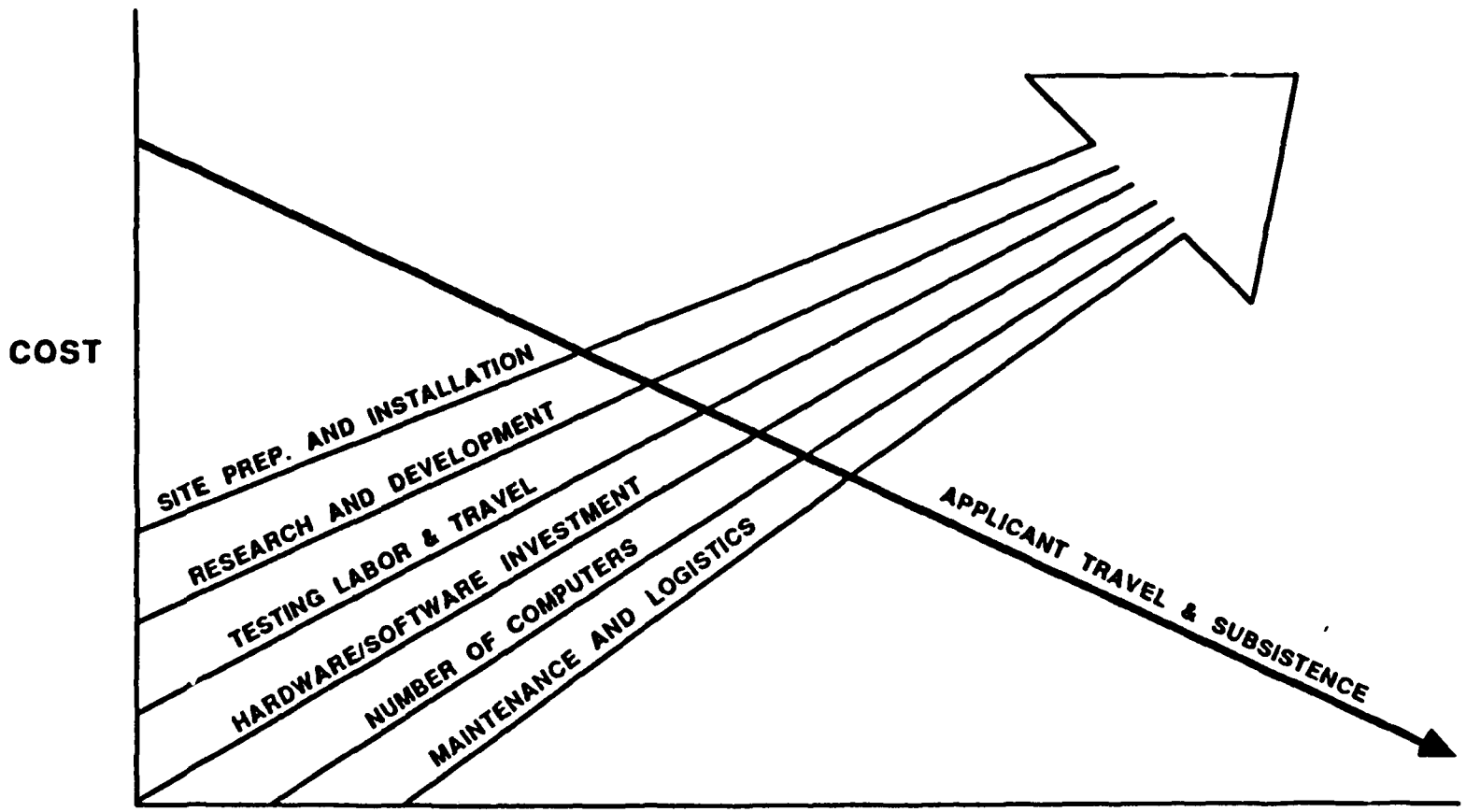
CAT-ASVAB PROGRAM CONCEPT OF OPERATION AND COST/BENEFIT ANALYSIS

LIFE CYCLE COSTS (LCC)
($Millions)

Alternative	R&D	Invest-ment	OPS & Support	Total	LCC Increase
P&P — Baseline	0	0	223	223	—
A — Centralized	9	5	226	240	8%
B — High Volume Site	9	10	280	299	34%
C — CASCAT*	10	11	224	245	10%
D — Mobile	9	31	315	355	59%

* Computerized Adaptive Screening and CAT-ASVAB Testing

CAT-ASVAB ECONOMIC ANALYSIS
OPERATIONS CONCEPT LIFE CYCLE COST IMPACTS AND TRADEOFFS



CAT-ASVAB PROGRAM CONCEPT OF OPERATION AND COST/BENEFIT ANALYSIS

IMPLEMENTATION CONSIDERATIONS

A – CENTRALIZED

- Easiest to Implement/Manage
- Lowest Investment Cost
- Requires Increased Testing Space in MEPS
- Testing Impeded in MEPS with Limited Space
- Requires TA Staff Increase (100 - 200%)
- Requires Increased Lodging Capacity at MEPS
  — Serious Problem for Some MEPS
- Reduces Service Level to Recruiters
- Increases Applicant Travel Time & Costs
- Reduces Recruiter Travel

CAT-ASVAB PROGRAM CONCEPT OF OPERATION AND COST/BENEFIT ANALYSIS

IMPLEMENTATION CONSIDERATIONS

B – HIGH VOLUME SITES

- Most Current METS Will Not be Available on "No Cost" Terms For HVS Operation
- HVS Physical Security Measures Costly or Risky
- Requires TA Staff Increase (50-100%)
- Requires Many New Testing Facilities
- Reduces OPM Support Requirements for Production Testing
- Reduces Service Level to Recruiters
- Increases Applicant Travel Time & Costs

IMPLEMENTATION CONSIDERATIONS

C – COMPUTERIZED ADAPTIVE SCREENING and CAT-ASVAB TESTING

- Requires Significant Policy Changes
  — Pre-ASVAB Screening Test
- Requires Two Different Computer Types
  — Desktop for MEPS
  — Laptop/Handheld for Recruiters
- Requires TA Staff Increase
- Requires Increased Lodging Capacity at MEPS
- Requires Means to Manage Recruiter Administered Computerized Adaptive Screening Test (CAST)
- MEPS Anticipate Recruiter Misuse If Not Controlled

IMPLEMENTATION CONSIDERATIONS
D - MOBILE

- Requires Significant Policy Changes
- MEPS Foresee Problems (TDY, Morale, Maintenance)
- Highest Investment and O/S Costs of Concepts Evaluated
- MEPS Acceptance Sensitive to Responsibility Burdens
- Some Areas Not Suited for Vehicles (Innercity, Climate Extremes)
- Requires Extensive Logistics Support
- Vehicle Associated Liabilities
- Requires TA Staff Increase (50%)
- Most Flexible and Convenient for Recruiters
- Best Platform for Future Test Implementation
- Resolves Many Site and Security Issues
- Potential for Multi-Use Cost Offset (Mobile Recruiting)
- Provides DoD Greater Control over Testing Resources

CAT-ASVAB PROGRAM CONCEPT OF OPERATION AND COST/BENEFIT ANALYSIS

KEY MEPS CONCERNS

- Foresee Increased Staffing Requirements for Test Administration
- Anticipate Logistics Problems Associated with Computer Resources
- Concerned with Accountability for Computer/Test Resources
- Interdependence of Production and Student Testing Programs - Particularly OPM Testing Support
- Lack of Control Over MET Sites Complicates Installation and Operation (Alternatives B&D)
- Recruiter Attitudes Toward Screening (Alternative C)
- See Need for Recruiters Input

CAT-ASVAB PROGRAM CONCEPT OF OPERATION AND COST/BENEFIT ANALYSIS

BENEFITS OF ADAPTIVE TESTING

- Reduced Testing Time
- More Accurate in Extremes of Ability Distribution
- On-line Validation of Test Items
- Enhanced Examinee Motivation
- Improved Test Security
  - — Each Test is Unique

CAT-ASVAB PROGRAM CONCEPT OF OPERATION AND COST/BENEFIT ANALYSIS

BENEFITS OF COMPUTERIZATION

- Improved Standardization
- Reduced Test Scoring Labor
- Reduced Clerical/OMR Error
- Ease of Test Revision
- Improved Test Security
- Improved Motivation
- Immediate Availability of Test Results
- Flexible Test Sessions
- New Test Types Possible
- Automated Data Base

CAT-ASVAB PROGRAM CONCEPT OF OPERATION AND COST/BENEFIT ANALYSIS

SUMMARY

- **MEPS Preference: (Based on 59 MEPS Responses)**
  - — Concept Ranking / Concept Rating (1-5)

Concept Ranking	Concept Rating (1-5)
B (HVS)	B 207/295
C (CASCAT)	C 176/295
D (MOBILE)	D 161/295
A (CENT)	A 140/295

  - — 48% Chose B as Best Overall Alternative
  - — 29% Chose C as Best Overall Alternative

- **Life Cycle Costs:**
  - — All CAT-ASVAB Concepts Evaluated Would Increase Testing Costs Under Existing Policies and Constraints
  - — Alternative C has Potential to Reduce Recurring Costs Below P&P ASVAB (Dependent on CAST Effectiveness)
  - — Alternative D Appears Cost Prohibitive Unless Multi-Use Benefits Offset Costs

CAT-ASVAB PROGRAM CONCEPT OF OPERATION AND COST/BENEFIT ANALYSIS

SUMMARY (CONTINUED)

- **Benefits:**
  - — **Most Promising Economic Benefits Areas are:**
    - -- **Improved On-The-Job Performance**
    - -- **Enhancement of "Willingness to Enlist" (Reduce Recruiting Costs)**
    - -- **Reduction in First Tour Attrition (Reduce Recruiting and Training Costs)**
  - — **Major Benefits will be Realized through New Tests**
- **System Acquisition Strategy/POA&M Beyond ACAP not Defined in Current Program Guidance**

CAT-ASVAB PROGRAM CONCEPT OF OPERATION AND COST/BENEFIT ANALYSIS

RECOMMENDATIONS

- Redirect CAT-ASVAB Research to Focus on New Cognitive Tests that Can Only be Administered by Computer
  - — Incorporate Services New Cognitive Tests which Enhance Prediction of Job Performance
- CAT-ASVAB as Currently Configured will not be Implemented
- ACAP Score Equating & Verification Continue to Completion
  - — Boston, Omaha, Jackson Completed (Dec 88)
  - — Score Verification Completed (Apr 92)
  - — Requirement Still Exists to Demonstrate that Paper and Pencil ASVAB Can be Equated to the Computerized Test
- Validate New Computerized Test Battery Across Major Job Clusters Within Each Service
  - — CAT-ASVAB Administered at RTCs
  - — New Computerized Test Battery Administered at RTCs

CAT-ASVAB PROGRAM CONCEPT OF OPERATION AND COST/BENEFIT ANALYSIS

RECOMMENDATIONS (CONTINUED)

- Service Validation of New Computerized Test Battery To Begin at Conclusion of Accelerated CAT-ASVAB Project
- Determine Cost Effectiveness of New Computerized Test Battery
- Develop National Norms for the New Computerized Test Battery
- Refine and Validate CAST for Use as DoD-Wide Preenlistment Screen

APPENDICES

Topical Area Review Attendees - 8 & 9 December 1988

Name	Address	Telephone
ALLUISI, Earl A..	OUSD(A)/DDDR&E(R&AT) The Pentagon, Room 3D129 Washington, DC 20301-3080	AV 225-9777
ARABIAN, Jane	ARI PERI-RS 5001 Eisenhower Avenue Alexandria, VA 22333-5600	703-274-8275
BLOXOM, Bruce	DMDC Monterey, CA 93940	AV 878-2951
BRANCH, Richard	HQ USMEPCOM Testing Directorate 2500 Green Bay Road North Chicago, IL 60064	312-688-3438
CARROLL, Robert M.	CNO (OP-01B2) Washington, DC 20350	AV 224-5618
COOK, Paul Lt.Col.	HQ USAF/DPXOA The Pentagon Washington, DC 20330	202-695-9855
EATON, Newell Kent	ARI 5001 Eisenhower Avenue Alexandria, VA 22333-5600	AV 284-8844
HADDAD, Genevieve	HQ AFSC/XT Andrews AFB, MD 20334-5000	AV 858-2366
HANSER, Larry	ARI 5001 Eisenhower Avenue Alexandria, VA 22333-5600	AV 284-8275
HIGGINS, Mike Lt. Col.	USAF SAF/AQT The Pentagon Washington, DC 20330	202-695-7866
JEWEL, James S. Col.	HQDA (DAPE-MPA) The Pentagon Washington, DC 20310	AV 227-3318
JOHNSON, Edgar	ARI 5001 Eisenhower Avenue Alexandria, VA 22333-5600	AV 284-8636

KLEMMER, Robert	HQDA Research & Studies Office The Pentagon - Room 2D736 Washington, DC 20330	202-695-0516
KUHN, Bart	CNO (OP-987H) Rm 5E683 Pentagon Washington, DC 20350-2000	AV 224-4480 202-694-4480
KYLLONEN, Patrick	AFHRL/MOEL Brooks AFB, TX 78235	AV 240-3570 512-536-3570
LANCASTER, Anita	OASD (FM&P) The Pentagon - Room 2 B 271 Washington, DC 20301	AV 227-9271
LANTERMAN, Richard	US Coast Guard G-PWP 2100 2nd Street, S.W. Washington, DC 20593-0001	202-267-2986
LEHNUS, Jerry	Defense Manpower Data Center 1600 Wilson Boulevard, Suite 400 Arlington, VA 22209	703-696-4066
LEIGHTON, Dan LTC, USAF	AFHRL/MO Brooks AFB, TX 78235	AV 240-2244
MARTIN, Clessen	CNO (OP-136) Navy Annex Wing 8, Room 2840 Washington, DC 20350	AV 224-5559
MOSES, Frank	ARI 5001 Eisenhower Avenue Alexandria, VA 22333-5600	AV 284-8816
OLSON, Darlene	ARI/PERI-RS 5001 Eisenhower Avenue Alexandria, VA 22333-5600	AV 284-8275
ORLANSKY, Jesse	IDA 1801 N. Beauregard Street Alexandria, VA 22311	703-578-2836
PASS, John	NPRDC/12 San Diego, CA 92152	AV 553-7642
PATSY, William (Ron)	HQDA (DAPE-MPA) The Pentagon - Room 2 B 717 Washington, DC 20310	AV 225-0836

REE, Malcolm	AFHRL/MOA Brooks AFB, TX 78235	AV 240-3256
RIEMER, Stephen	AF Human Systems Division (HSO/CIF) Brooks AFB, TX 78235	AV 240-3687
RUCK, Henk	HRL/CA(Acting) Brooks AFB, TX 78235-5601	AV 240-3605
RUMSEY, Michael	ARI 5001 Eisenhower Avenue Alexandria, VA 22333-5600	Av 284-8275
SANDS, William A.	NPRDC - Code 13 San Diego, CA 92152-6800	AV 553-9266 619-553-9266
SELLMAN, W. Steven	OASD(FM&P) The Pentagon - Room 2 B 271 Washington, DC 20301	AV 225-5525
SINAIKO, H. Wallace	Smithsonian Institution 801 N. Pitt Street Alexandria, VA 22314	703-357-1829
TANGNEY, John	AFOSR/NL Washington, DC 20332	202-767-5021
WALKER, Clinton	ARI (PERI-RS) 5001 Eisenhower Avenue Alexandria, VA 22333-5600	703-274-8275 AV 284-8275

OFFICE OF THE SECRETARY OF DEFENSE

WASHINGTON, D.C. 20301

09 NOV 1988

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (M&RA)
ASSISTANT SECRETARY OF THE NAVY (M&RA)
ASSISTANT SECRETARY OF THE AIR FORCE (AQ)

SUBJECT: Topical Area Review -- Testing R&D and Planned Applications to Enlisted Personnel Selection and Classification

A topical area review of testing R&D and planned applications to enlisted personnel selection and classification will be held on December 8-9, 1988, at the Institute for Defense Analyses (IDA), Alexandria, Virginia. The review is intended to bring the testing R&D and user communities together to ensure that each is aware of developments and plans of the other, and that the R&D is relevant to existing and planned programs.

Interest and concern have been expressed by the Congress, OSD, and the Services regarding the R&D test-development process to ensure equitable screening, selection, and classification of enlisted personnel. A major purpose of this review is to cover the R&D being conducted and planned in these areas, as well as plans for the implementation of the products being developed by the R&D. Additionally, the review will provide an opportunity to identify any gaps in R&D that need to be filled, as well as any new developments or initiatives for which transition plans need to be drawn.

Policy perspectives will be provided at the review by the Assistant for Training and Personnel Systems Technology (ODDDR&E/R&AT) and the Director for Accession Policy (OASD/FM&P). We request that you nominate one or more persons from each of the R&D and user sides of the enlisted personnel testing communities to represent your Military Department or Service(s) at this meeting. The tentative agenda is attached. Topics to be addressed are to include both the existing and planned R&D and use of tests for enlisted personnel selection and classification, and should include present R&D program status, accomplishments, future plans, and 5-year funding profiles. Please provide by December 1, 1988, the name(s) of your R&D representatives(s) to Dr. Earl A. Alluisi at (202) 695-9777, and your user representative(s) to Dr. W. S. Sellman at (202) 695-5525.

George P. Millburn
Deputy Director
Defense Research and Engineering
(Research and Advanced Technology)

Grant S. Green, Jr.
Assistant Secretary of Defense
(Force Management and Personnel)

Attachment:
As stated